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Governance and Financial Fragility: Evidence from a Cross-Section of Countries

by

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Governance and Financial Fragility: Evidence from a Cross-Section of Countries

by

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Abstract

The author explores the role of governance mechanisms as a means of reducing financial fragility. First, he develops a simple theoretical general-equilibrium model in which instability arises due to an agency problem resulting from a conflict of interest between the borrower and lender. In particular, when governance is weak and transaction costs are high, the share of capital assets that creditors can claim as collateral is highly sensitive to shocks. As a result, there is financial fragility, in that the willingness of agents to finance productive investments is sensitive to shocks. Second, using a data set that contains over 90 industrialized and developing economies, the author tests the hypothesis that governance is important in explaining financial fragility (measured as the likelihood of a banking crisis and investment volatility). His results show that institutions, rules, and laws that govern the financial environment are of first-order importance for the stability of financial systems. The author finds that, while better legal systems are particularly important, so are democratic institutions that limit the power of the executive.

JEL classification: G0
Bank classification: Business fluctuations and cycles; Financial markets

Résumé

L'auteur examine le rôle des mécanismes de gouvernance comme moyen de réduire la fragilité financière. Premièrement, il élabore un modèle théorique simple d'équilibre général dans lequel un problème de délégation issu d'un conflit d'intérêts entre l'emprunteur et le prêteur crée de l'instabilité. En particulier, lorsque la gouvernance est faible et que les coûts de transaction sont élevés, la part des immobilisations que les créanciers peuvent demander en garantie est très sensible aux chocs. Il y a par conséquent fragilité financière, dans la mesure où la volonté des agents de financer les investissements productifs est sensible aux chocs. Deuxièmement, à l'aide d'un ensemble de données portant sur plus de 90 économies industrialisées et en développement, l'auteur teste l'hypothèse voulant que la gouvernance permette d'expliquer la fragilité financière (mesurée par la probabilité d'une crise bancaire et la volatilité des investissements). Les résultats obtenus indiquent que les institutions, les règles et les lois qui régissent le secteur financier jouent un rôle de premier ordre dans la stabilité des systèmes financiers. L'auteur constate que, si de meilleurs systèmes juridiques revêtent une grande importance, c'est également le cas des institutions démocratiques qui limitent le pouvoir exécutif.

Classification JEL : G0
Classification de la Banque : Cycles et fluctuations économiques; Marchés financiers

1. Introduction

Following a period of financial turbulence during the latter half of the 19th and early 20th centuries, the world entered a period of relative stability, though one in which global markets were heavily regulated and controlled. As Allen and Gale (Forthcoming) point out, however, the reliance on severe intervention came at the cost of economic efficiency. A subsequent rethink and financial deregulation have revealed weaknesses in many financial markets and resulted in a return to financial instability around the globe. A search is therefore underway for the sources of financial fragility, in the hopes of eliminating the costs associated with a financial crisis without the costs of excessive regulation.[1]

Since the 1998 Asian crisis, there has been a growing consensus that governance (that is, the "rules of the game" that govern the way economic agents interact) can play an important role in determining the fragility of financial markets (see, for example, Rajan and Zingales 1998). This paper examines the link between governance and financial fragility in more detail. First, a simple theoretical model is developed that links financial fragility and the cost of enforcing a financial arrangement between borrower and lender. The model is used to demonstrate that financial fragility can be mitigated by governance mechanisms that lower this cost. Second, the link is examined empirically. The findings are consistent with the view that good governance is important for ensuring the stability of the financial system.

The view in this paper is that financial fragility occurs when the willingness of economic agents to continue to finance positive net present-value investment opportunities is susceptible to relatively small economic shocks; this may be true even if these events have no direct impact on the fundamentals of the economy. With this definition in mind, it is clear that, for financial fragility to arise, markets must fail.[2,3]

There are many reasons why markets fail, but the view in this paper is that the key source of market failure is a combination of (i) asymmetric information, (ii) the conflict of interest between borrowers and lenders, and (iii) poor governance (that is, a lack of appropriate rules, both explicit

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1. It is well documented that the costs of financial crises are enormous. Honohan (1997) estimates that just the public sector costs of resolving banking crises in developing countries between 1980 and 1995 amounted to US$250 billion. There are other private economic costs, such as forgone investment and social costs. For an account of the social impacts of a banking crisis in Myanmar, see Scott Mathieson (2003).
2. Although real-business-cycle models with complete, perfectly competitive markets also allow shocks to be transmitted through the economy via financial markets, these fluctuations are optimal and not consistent with the definition of financial fragility used in this paper.
3. Bordo (1986) provides an excellent historical account and review of the earlier literature.

and implicit, that govern the environment in which economic transactions are made). Together, these features produce so-called "agency problems" that prevent market participants from making economically efficient transactions. This viewpoint is certainly not unique. The finance literature stresses that agency problems are a key source of market failure in financial markets.[4] Mishkin (2001, 3) goes further and defines a financial crisis as the "disruption to financial markets in which adverse selection and moral hazard problems become much worse, so that financial markets are unable to efficiently channel funds to those who have the most productive investment opportunities." Given such problems, many authors (e.g., Zingales 1998) argue that good governance plays an important role in alleviating the potential inefficiencies these asymmetric information problems cause. This paper stresses the importance of agency problems as the underlying source of financial fragility, and the role of good governance in mitigating financial fragility.

From a theoretical standpoint, this paper is in keeping with the branch of research on financial multipliers (Bernanke and Gertler 1989) and credit cycles (Kiyotaki and Moore 1997).[5] In those papers, because of an agency problem, the ability of investors to raise credit and finance investment is determined by the health of their "balance sheets" and their ability to provide collateral. As a result, some investors are credit constrained and a small shock to the economy can, via the pecuniary externality on the firm's balance sheet, have a substantial impact on the level of credit provision and investment. In keeping with the research papers, the model developed in section 2 incorporates a borrowing constraint for some firms in the economy, which limits their ability to finance investment and production. The extent of the constraint is endogenously determined and the resulting equilibrium exhibits multiplier effects. Interestingly, the model also exhibits another important source of instability: multiple equilibria. In particular, for some range of parameter values, a small shock is likely to produce a sudden jump in the equilibrium outcome that is not easily reversed by a change in parameter values. That is, the economy also exhibits fragility of a form that can be referred to as financial hysteresis.

From an empirical viewpoint, this paper is related to the recent literature on systemic banking crises (e.g., Demirgüç-Kunt and Detragiache, henceforth DKD, 1998a and b, 2002; Santor 2003). Those authors focus on the macroeconomic determinants of banking crises. Thus, their papers are very much in keeping with the business cycle view of banking crises (Mitchell 1941; Gorton

4. The finance literature also stresses agency problems between firm owners and managers (Jensen and Meckling 1976). These problems are certainly important, and closely related to this paper's standpoint, but they are not the main focus in this paper.

5. There is also a similarity between the model developed here and the new generation of currency crisis models developed by Krugman (1999, 2001).

1988).[6] However, all of these studies also find support for the notion that better enforcement of property rights can lessen the likelihood of a crisis, a finding that is in keeping with the recent corporate governance literature (see Zingales 1998; La Porta, Lopez-de-Silanes, Shleifer, and Vishny, henceforth LLSV, 1998). The empirical part of this paper explores this last aspect in more detail, and asks whether governance mechanisms other than the rule of law can also affect the likelihood of a crisis. In that sense, this paper is more closely related to the empirical work of Johnson et al. (2000), who find that various measures of corporate governance can explain recent emerging-market crises better than standard macroeconomic variables.[7]

Like Johnson et al., the empirical findings reported in this paper suggest that governance definitely matters for financial stability, both in terms of a reduced likelihood of a banking crisis and reduced investment volatility. Moreover, the nature of the governance mechanism is important. In particular, while better bureaucracies seem to help, so do mechanisms that make governments more accountable to the public, such as democracy, competition in the political process, and constraints on executive power. On the other hand, institutions that tend to increase government control and influence tend to increase the likelihood of crisis.

This paper is also related to the rapidly growing literature on governance and economic development (Kaufmann, Kraay, and Zoido-Lobaton 1999; Easterly and Levine 2002). Using a variety of governance indicators (many also used in this paper), these authors demonstrate that there is a causal link between better governance and economic development. While this paper does not test this link empirically, the model developed in section 2 demonstrates that institutions that improve contractability also lead to higher levels of investment and output.

This paper is organized as follows. Section 2 develops a simple theoretical model that provides some insight into the link between financial fragility and governance. Section 3 sets out the empirical methodology to be used to test the hypothesis that governance matters for financial fragility, and describes the data to be used. Section 4 discusses the results. Section 5 concludes. The results of this study show that institutions, rules, and laws that govern financial relationships are of first-order importance for the stability of financial systems.

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6. These studies also examine some other important causes of systemic banking crises, including financial liberalization (DKD 1998a), deposit insurance (DKD 1998b, 2002), and contagion (Santor 2003).

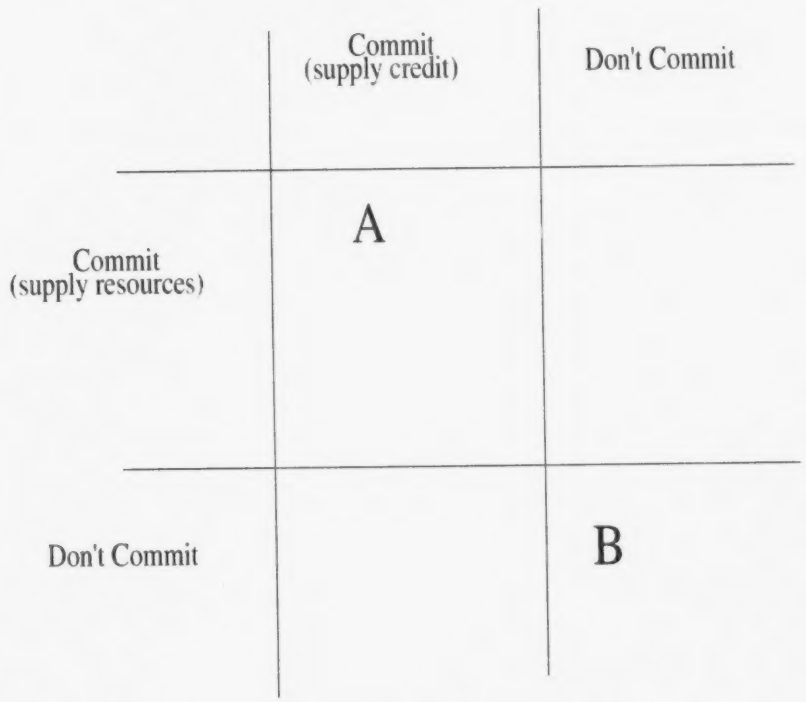
7. This paper differs from Johnson et al. in two main areas. First, while Johnson et al. use currency and stock market volatility to proxy for financial crises, this paper uses investment volatility and systemic banking crises, because these measures are available for a larger set of countries. Second, while Johnson et al. examine 23 emerging economies during the 1997–98 period, this paper uses data from over 90 countries from 1984 to 2001.

2. An Analytical Framework

2.1 The commitment problem

Figure 1 illustrates the payoff matrix for a "commitment" game played between a borrower (say, an entrepreneur with a positive net present-value investment project to finance) and a lender (say, a household). To generate a return from the investment project, both borrower and lender are required to commit resources to the project. Thus, the lender decides whether to supply credit to the borrower, and the borrower decides whether to commit resources (e.g., land, human capital) to the project. The outcome of the game depends on the payoffs the two players face. A "good" outcome is one in which the borrower has committed to repay the loan and the lender is willing to supply credit. In Figure 1, this outcome is illustrated by the label "A." There are a number of other possible outcomes. Label "B" illustrates a "bad" outcome in which neither player is prepared to commit to the project. Depending on the payoffs, the game could also produce multiple equilibria, in which case both A and B may be equilibrium outcomes.

Figure 1: The Commitment Game



Ostrom (1998) refers to games like the one illustrated in Figure 1 as a second-order game. While the outcomes of these games are clearly important, it is the first-order game, in which the rules and mechanisms that govern the second-order game are determined, that is of importance to the economy. The reason is simple. It is the rules of the game that, by and large, determine the payoffs agents face, and hence the outcome of the second-order game. If the "right" set of rules are chosen (i.e., a set of rules governing the agents' behaviour that allow them to overcome their conflict of interest), then a good outcome in the first-order game is ensured.[8]

In the case considered here, the purpose of the first-order game played between borrower and lender is to establish a set of rules that govern how the two are able to share the surplus generated by the investment project. There is no general theory to explain how these games are played. Zingales (1998, 2000) argues that an understanding of the governance mechanism regarding the division of surplus remains one of the key questions in corporate finance. Nevertheless, the rules are clearly important, since the rules that are agreed upon (either explicitly or implicitly) determine the payoff structure and ultimately whether the investment project is to be financed.[9] For example, consider a situation in which the two players are governed by no rules and an absence of rights: it is most likely that, even if both players commit themselves to the investment project, the rent-seeking free-for-all that would follow would result in the complete loss of any surplus value that the project may have generated. As a result, an equilibrium such as B is the likely outcome. However, if the two players are governed by a system that recognizes property rights and that allows those rights to be contracted upon and transferred through voluntary exchange, then outcome A can be achieved. Somewhere in between, the two players may be governed by a set of weakly enforced property rights. In that case, depending on the exact nature of the rules, any version of the game is possible, including the multiple-equilibrium case, which resembles a game of "assurance" (i.e., one in which the players play an "I'll commit if you commit" strategy). Section 2.2 develops a simple model that allows these three possibilities to arise endogenously as a function of the environment governing the financial transaction.

8. Ostrom, Gardner, and Walker (1994) use a case study approach to examine how first-order games are resolved in common property situations; i.e., how communities develop governance mechanisms to allocate resources and the characteristics of successful solutions.

9. Zingales (1998) defines a governance system as the complex set of constraints that shape the ex-post bargaining power over the quasi rents generated in the course of a relationship.

2.2 A simple model

2.2.1 Production

The economy produces two goods, 1 and 2, and employs two fixed factors of production: land, T, and labour, N. Land is assumed to be owned by a fixed number of landowners, while labour is inelastically supplied by N workers. For reasons that will become clear, it is assumed that landowners cannot supply labour, nor can they lease their land to workers. The economy is taken to be small and open; however, it is assumed that there are no international capital flows.

Production takes place according to constant returns to scale; however, good 1 is produced using labour alone, while good 2 is produced using both factors. To generate a demand for credit, it is assumed that production takes time. Specifically, land and labour are employed in the current period, t; however, output cannot be sold until the following period, $t+1$. The production functions for the two goods are therefore:

$$y_{1,t+1} = N_{1,t}; \text{ and,} \tag{1}$$

$$y_{2,t+1} = F(N_{2,t}, T). \tag{2}$$

It is assumed that F satisfies the standard neo-classical assumptions, $F_N > 0$, $F_{NN} < 0$, and $F_{TN} > 0$. In addition, it is also assumed that $F_{TNN} < 0$. This additional assumption avoids the value of land growing at an increasing rate with the level of employment in sector 2. Consistent with these assumptions, it will prove convenient to assume that F has the form of a Cobb-Douglas production function:

$$y_{2,t+1} = N_{2,t}^{\alpha} T^{1-\alpha}. \tag{2a}$$

2.2.2 Firms and financing

Now consider the financing of production. Because production in industry 1 requires only labour, it is assumed that firms in this sector are owned by self-employed workers. On the other hand, the restrictions on ownership and control of land imply that firms in industry 2 are owned by landowners. This difference in ownership across the two sectors is key, because it implies that firms in each sector face different financing constraints.

Because they are self-employed, workers in sector 1 face no asymmetric information or agency problems vis-à-vis their employer. As a result, firms in this industry can self-finance, and are therefore unconstrained in terms of the supply of credit they face.

In sector 2, matters are more complicated. Although firms own their own land, they must hire workers who are external to the firm. Moreover, they must hire them in advance of production. This creates a demand for external finance equal to the wage bill in this sector. It is assumed that workers are the sole source of this finance. Effectively, sector 2 firms can be thought of as having to go to a bank (not modelled) to borrow their wage bill. The wage bill is immediately deposited into workers' bank accounts to be spent in the subsequent period.

When borrower and lender are not the same, their incentives differ. In particular, borrowers have an incentive not to repay creditors. This difference in incentives changes the financing arrangements for sector 2 firms. For example, if it is difficult to claim the right to a future share of profits, creditors will not accept equity in a firm. Instead, creditors may prefer to accept a debt contract that allows the creditor to claim a tangible asset should the borrower fail to repay.[10] Under these conditions, the most that creditors are willing to lend to borrowers is the value of collateral that borrowers can post. In the case being considered here, it is assumed that, although borrowers cannot credibly issue equity, they can potentially offer land as collateral, and therefore the present value of landholdings by sector 2 firms defines an upper limit on the amount that firms in this sector can borrow. The implication is that firms in sector 2 may be credit constrained, and therefore there may be a limit on the size of the wage bill that they can finance.

The present value of land, V, at time $t+1$ is simply the discounted present value of all future rental income from land:

$$V_{t+1} = \frac{pMP_T}{r}T,$$

where MP_T is the marginal product of land, p is the relative price of good 2, and r is the interest rate.[11]

Consequently, the external borrowing constraint for sector 2 firms at time t, B_t, is given by:

$$B_t = s\frac{pMP_T}{r(1+r)}T, \tag{3}$$

where s is some fraction (to be determined), $0 < s \leq 1$.

10. This is a standard explanation for debt financing and the importance of banks in financial markets relative to other forms of financing, such as equity. See Hart (1995) for a formal discussion of debt arising from agency problems.
11. Good 1 is taken as the numeraire.

2.2.3 *Governance and access to credit*

In the best of cases, $s = 1$; however, in reality, s is likely to be less than 1, and the maximum firms can borrow may be less than the value of the borrower's land. The main reason is that, in addition to a desire to avoid repayment, the borrower has an incentive to avoid the transfer of collateral, thereby imposing an additional cost on the lender should the borrower default. These costs can be thought of as either a resource cost (involving the hiring of a collection agency, for example), or, perhaps more importantly, a transaction cost, because it often takes time for collateral to be transferred, and borrowers can be expected to defer the transfer date as long as possible. The longer the creditor must wait, the lower the realized value of the collateral. To that extent, in the event of default, lenders can effectively claim only a fraction, s, of the value of the collateralized land. It is reasonable to assume that increasing s comes at an increasing marginal cost. For simplicity, assume that the marginal cost of increasing the amount of collateral the creditor can claim in case of default is

$$MC = \frac{a}{(1-s)},$$

as Figure 2 illustrates. The marginal cost of transferring collateral is shown to be an increasing function of the share of collateral that is transferred. The parameter a affects the position of the locus. Higher values of a correspond to a higher marginal cost of collateral transfer.

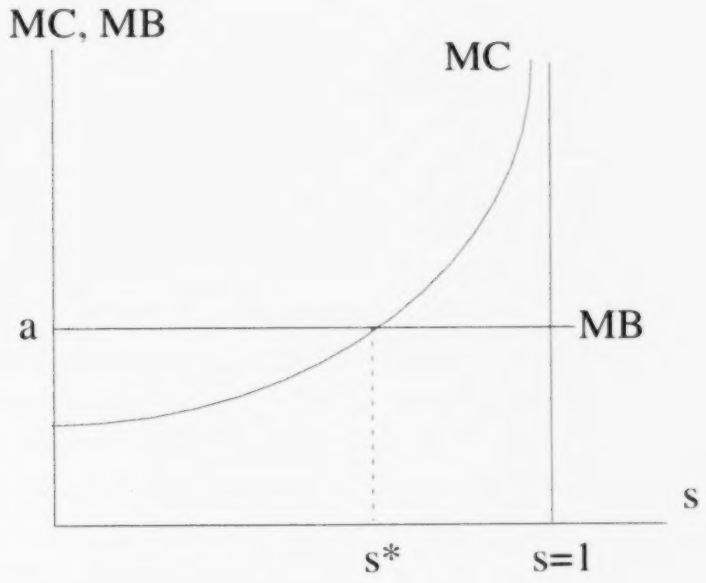
It is sensible to think of the parameter a as a measure that reflects the existence and quality of measures that govern relationships between borrower and lender. Better governance mechanisms, such as bankruptcy laws, fast efficient legal systems, and arbitrators, can lower the costs of transferring collateral and hence lead to lower values of a.[12]

The marginal benefit of transferring an additional unit of collateral is simply the value of an additional unit of land:

$$MB = \frac{pMP_T}{r}.$$

12. To the extent that better governance can lower the costs of contracting, one could also think of a as reflecting the degree of contractability in financial markets.

Figure 2: Governance and the Share of Assets that can be Collateralized



Since the marginal benefit of transferring collateral is independent of the share of collateral transferred, the marginal benefit curve is illustrated as the horizontal locus in Figure 2. As shown in the diagram, equilibrium occurs when marginal costs are equated with marginal benefits,

$$s = 1 - \frac{ar}{pMP_T}. \tag{4}$$

As one would expect, better governance, by lowering a, leads to a greater value of s. In other words, when the standard of governance is high, the share of physical assets that firms can credibly post as collateral is greater. More importantly, note that when a is small, s is relatively insensitive to shocks that affect property prices and firms are able to use close to the entire value of land as collateral. But when a is large, the fraction of the land value that can be used is not only small but highly sensitive to shocks affecting property prices. The implication is that poor governance can lead to financial fragility because the share of capital assets that can be used as collateral is sensitive to shocks that affect their value when governance is weak.

Together with (4), equation (3) serves to determine the borrowing constraint:

$$B \leq \frac{(pMP_T/r - a)T}{(1+r)}. \tag{5}$$

The conditions under which this constraint is binding are discussed further below.

2.2.4 *Equilibrium*

In a competitive equilibrium, the wage must be equal to the value of the marginal product of labour in the unconstrained sector of the economy. Letting good 1 be the numeraire, equation (1) implies that the competitively determined wage paid at time t is given by:

$$w = \frac{1}{(1+r)}.$$

The corresponding total wage bill for sector 2 firms is therefore:

$$wN_2 = \frac{N_2}{(1+r)}. \tag{6}$$

Under the assumption that the borrowing constraint binds, equations (5) and (6) form a two-equation system for determining equilibrium in the constrained model:

$$wN_2 = B, \tag{7}$$

or,

$$N_2^c = (pMP_T/r - a)T.$$

In the case when the borrowing constraint is not binding, the equilibrium condition is replaced by the usual marginal product of labour condition for sector 2:

$$1 = pMP_N. \tag{8}$$

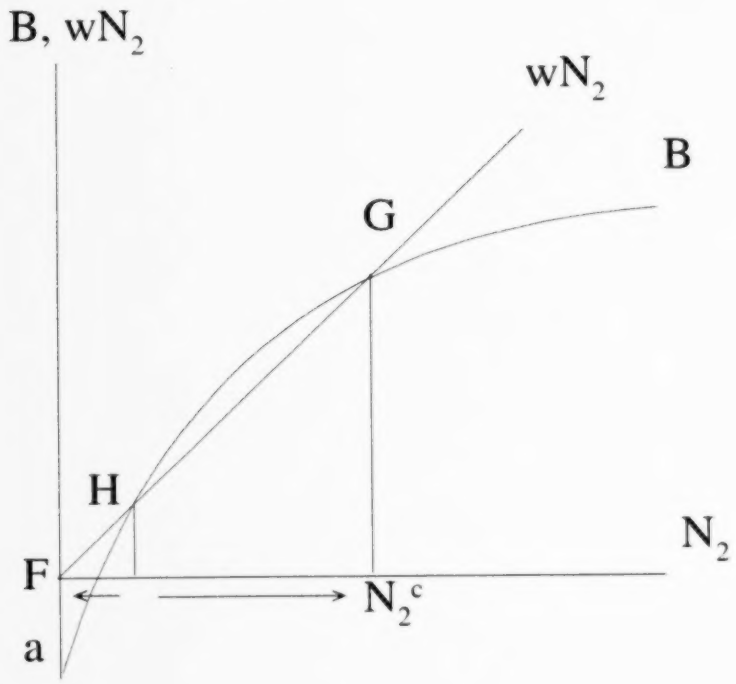
Assuming that the production function is of the Cobb-Douglas type, as in equation (2a), the equilibrium values of N_2 in a constrained and unconstrained economy are given by (7a) and (8a), respectively:

$$N_2^c = T\left(\frac{p}{r}\left(\frac{N_2}{T}\right)^{\alpha}(1-\alpha) - a\right) \tag{7a}$$

$$N_2^* = T(\alpha p)^{(1/(1-\alpha))}. \tag{8a}$$

It can be readily determined that (7a) potentially exhibits multiple equilibria if $a > 0$ (Figure 3). The borrowing constraint, equation (5), is illustrated by the B locus. Its shape can be explained as follows: when $N_2 = 0$, the marginal product of land is zero, and consequently it has no value.

Figure 3: Equilibrium with a Binding Borrowing Constraint



As employment rises, the value of land also rises; however, with the assumption that $F_{TNN} < 0$, the value of land rises at a diminishing rate.[13] The wage bill is given by equation (6). The marginal product of labour is constant (determined by the market clearing condition in sector 1 that the value of the marginal product equals the wage), and consequently the locus illustrating the wage bill is linear.

The dynamics of adjustment to equilibrium can be explained as follows: assuming $N^C < N^*$, if the borrowing constraint is not binding (i.e., $wN_2 < B$), firms increase the level of employment, because the marginal product of labour in this sector exceeds that in sector 1. On the other hand, if firms cannot afford to borrow the wage bill, they reduce employment until such time as the borrowing constraint just binds, or the level of employment reaches zero. As a result, when $a > 0$, this model exhibits multiple equilibria.[14] In the case shown in Figure 3, there are two stable

13. The benefit of this assumption is that it constrains the model to focus on sources of financial fragility that arise for reasons other than simply the shape of the production function. Although the properties of the production function are extremely important, as will be discussed, this assumption eliminates one source of fragility that arises solely due to a quirk in the production function specification. This assumption is also implicit in many of the standard specific functional forms, such as the Cobb-Douglas production used here, and in this sense it is a relatively weak assumption.

14. The potential for models in which a productive factor is also used to secure loans to generate multiple equilibria has been illustrated by Krugman (2001).

equilibria, at F and G, and one unstable equilibrium, H. F is an equilibrium, because with no workers employed in sector 2, land has no value. Hence, the marginal benefit of transferring land is zero and the marginal costs are positive ($a > 0$). Consequently, when $N_2 = 0$, firms are unable to borrow against their land.

Two special cases should be noted. First, if $a > 0$, then the borrowing constraint passes through the origin and there is a unique stable equilibria, with $N_2 > 0$. Second, there is some positive value of a, a^*, such that if $a > a^*$, then the borrowing constraint does not intersect the wage bill locus for any value of N_2, and hence there is a unique stable equilibrium at $N_2 = 0$. Assuming that the production function has the Cobb-Douglas form in equation (2a), a^* can be determined by finding the value of N_2 for which $dB/dN_2 = 1$ and substituting this value of N_2 into (7a). Doing so gives:

$$a^* = \frac{(1-\alpha)}{\alpha}(\alpha(1-\alpha)p/r)^{1/\alpha}.$$

Clearly, a^* is strictly positive for $0 < \alpha < 1$.

2.2.5 Financial fragility

Financial fragility can arise in this model for two reasons. First, since the model exhibits multiple equilibria, it is subject to self-fulfilling changes in the equilibrium level of investment, because the value of land is a function of the level of employment in sector 2. If firms in the market are prepared to hire enough workers, then the value of land will be sufficiently high to make the borrowing constraint non-binding, and employment will increase until an equilibrium at G is reached. However, if, for some reason, firms in sector 2 plan to employ only a few workers, then the borrowing constraint will be binding and firms will not be able to afford to hire even the few workers they initially attempted to. Employment and output in the industry will fall, further reducing the value of the land and tightening the borrowing constraint.

This source of fragility is stated formally as Proposition 1.

Proposition 1: There is a range of values for a, $0 < a < a^*$, for which there are multiple equilibria: an unstable equilibrium, $N_2 = N_2' > 0$, and two stable equilibria—one with $N_2 = 0$ and the other with $N_2 = N_2''$, $N_2'' > N_2' > 0$. If $a = 0$, then there is a unique equilibrium with $N_2 > 0$, and if $a > a^*$, there is a unique equilibrium with $N_2 = 0$.

Proposition 1 suggests that for values for a, $0 < a < a^*$, the model behaves much like the game of assurance described earlier. As long as creditors and borrowers are both committed to a high level

of investment, that equilibrium can be self-sustaining. But a failure to commit to a high level of investment could lead to a low level of credit and employment in sector 2. Proposition 1 suggests that government involvement in the relationship to rule out one of the equilibria may be important in eliminating stability. Similarly, shocks that seem unrelated to economic fundamentals but important for the creditor-borrower relationship could cause a shift in the equilibrium outcome. This suggests that government involvement in credit markets (if it helps in relationship and confidence building) and political or corporate stability may be important determinants of financial stability.

A second source of fragility arises due to "accelerator" properties of the model. Changes in the model's parameters, such as the price of, say, good 2, affect the borrowing constraint and change the equilibrium level of credit and employment. If the borrowing constraint is sensitive to these parameter changes, then the level of investment can change dramatically. In Figure 3, if the slope of the borrowing constraint in the neighbourhood of point G is relatively steep, then one could argue that the equilibrium is "fragile."

Proposition 2a: From proposition 1, if $0 < a < a^*$, then there is a stable equilibrium, with $N_2 > 0$. This equilibrium is sensitive to changes in the parameters of the model, particularly for large values of a.

Proposition 2a implies that, when governance is weak (i.e., a is high), even small negative shocks can cause creditors to stop rolling over loans, causing a large fall in employment in sector 2, even though production in this sector is a positive net present-value activity.

To prove Proposition 2a, define the "η" financial accelerator as the elasticity of borrowing with respect to a given parameter, η. The size of the "accelerator" can be determined from considering equations (3), (4), and (7) (which are, respectively, the borrowing constraint, the equilibrium share of land value that can be used as collateral, and the equilibrium condition equating the borrowing constraint with the wage bill). These equations can be rewritten as functions of N_2, s, and the key parameter, η:

$$B = B(N_2, s, \eta), \tag{3'}$$

$$s = s(N_2, \eta), \tag{4'}$$

$$B = wN_2. \tag{7'}$$

By totally differentiating this set of equations and making the necessary substitutions, the financial accelerator can be found:

$$\frac{dB}{d\eta}\frac{\eta}{B} = \frac{\frac{\partial B}{\partial \eta} + \frac{\partial B}{\partial s}\frac{\partial s}{\partial \eta}}{1 - \frac{\partial B}{\partial N_2} - \frac{\partial B}{\partial s}\frac{\partial s}{\partial N_2}}\frac{\eta}{B}.$$

Considering only the equilibrium with a positive level of investment, the properties of the production function ensure that the denominator of the first term is positive.

For concreteness, consider the accelerator for two key parameters, p and a. In the case of p, the "terms-of-trade accelerator" is:

$$\frac{dB}{dp}\frac{p}{B} = \frac{1}{1 - \frac{Tp}{r}\frac{\partial MP_T}{\partial N_2}};$$

and the "contractability" accelerator is:

$$\frac{dB}{da}\frac{a}{B} = \frac{1}{1 - \frac{Tp}{r}\frac{\partial MP_T}{\partial N_2}}\frac{a}{pMP_t/r - a}.$$

The magnitudes of both accelerators are positive functions of a. That is, the terms-of-trade accelerator and the contractability accelerator are greater the greater the value of a, because, as discussed above, the ability to post collateral becomes increasingly fragile as a becomes larger. In the former case, the effect is indirect and arises because the value of $\partial MP_T/\partial N_2$ is larger when a is larger (a larger a results in a smaller N_2); in the latter case, the effect is both direct and indirect.

Even more dramatically, a change in the parameter values (say, an increase in the marginal cost of collateral transfer, or a reduction in the price of good 2) could cause the borrowing constraint to shift downwards sufficiently that it would no longer intersect with the wage financing requirement, resulting in a complete collapse in lending from an equilibrium at G to one at F. This would involve the "accelerators" approaching infinity. Since the model has multiple equilibria, however, we arrive at the striking result that, for an economy currently in a stable, positive investment equilibrium, a small change in parameter values (e.g., an increase in a) could result in a collapse in investment that cannot be reversed by a reversal in the parameter values. Thus, countries that experience a shock that leads to a complete collapse in financing and investment may be unable to return to the original level of investment, even if the shock was only transitory.

Proposition 2b: Starting from an equilibrium with $N_2 > 0$, and values of a close to a^*, the financial accelerator is infinitely large downwards and zero upwards.

The outcome of Propositions 1 and 2a and b is that governance measures that reduce the costs of enforcing (implicit or explicit) contracts with borrowers also reduce financial fragility. They do so in three ways: first, better governance tends to eliminate the likelihood of multiple equilibria; second, it reduces the size of financial accelerators; and third, it can reduce the likelihood that a small temporary shock could lead to a drastic and potentially irreversible jump in lending and investment.

The model presented in this section provides a reasonably simple story that explicitly models the relationship between governance and financial fragility. The story differs somewhat from existing ones in that it abstracts from capital accumulation (as in Bernanke and Gertler 1989), the accumulation of land by workers (as in Kiyotaki and Moore 1997), and the role of the banking system (as in Allen and Gale 2002, for example). Moreover, the model is static. Nevertheless, it generates some striking results, and provides new insight into the institutional sources of financial fragility. In particular, the results demonstrate that weak governance mechanisms can produce multiple equilibria and large multiplier effects.

3. Empirical Methodology and Data

3.1 Methodology

As the model developed in the previous section illustrates, agency problems can generate instability in a market economy. As a result, there is an incentive for societies to develop rules and institutions to govern economic behaviour in a way that alleviates the impacts of these problems and allows the market to achieve better outcomes, which in this case would be to alleviate financial fragility.

Financial fragility is difficult to quantify. In this paper, financial fragility refers to the extent to which the financial system's ability to finance investment is susceptible to failure. Thus, there are two dimensi to financial fragility: the strength of the financial system and the ability of the system to finance investment. Consequently, this study uses two measures of financial fragility: the incidence of systemic banking crises, and investment volatility as a proxy of the susceptibility of the financial system's capacity to finance investment activity.[15]

15. The measures were chosen because they are in keeping with the definition of financial facility used in this paper. Systemic banking crises occur when the whole banking system of a country has negative net worth, or when its capital assets are virtually exhausted. In such circumstances, the ability of the financial investment is constrained. Investment volatility is used as a proxy of the extent to which the ability of the financial system to continue to finance investment is susceptible to shocks. Other studies have used stock market, exchange rate volatility (e.g., Johnson et al. 2000).

Banking crises and investment volatility are related. Investment can fall drastically during a banking crisis. For example, over the period 1990 to 1993, during which Sweden suffered its banking crisis, investment fell from 25 per cent of GDP to 16 per cent; similarly, as Mexico went into crisis in 1994/95, investment fell from 21.4 to 14.2 per cent of GDP.[16] However, whereas a country is considered to either be or not to be in crisis, investment volatility is a continuous measure. Having two distinct measures is a useful means of ensuring that any findings regarding the role of governance are reasonably robust to different definitions of financial fragility. The rest of this section describes three empirical tests that can be used to identify whether governance can mitigate financial fragility. Section 3.2 gives a more detailed description of the data.

The first test uses a cross-section of countries to test whether investment volatility is explained by the level of governance in a particular country. A simple OLS cross-country regression is run:

$$Y_i = \alpha + \beta X_{1i} + \gamma X_{2i} + e_i,$$

where Y_i is the measure of investment volatility for country i, X_{1i} is a vector of country-specific control variables that are likely to affect volatility, X_{2i} is an indicator of the level of governance in country, i, and e_i is a country-specific error term. The controls used are population, average inflation over the 1984–2000 period, average level of domestic credit to the private sector, and ratio of investment to GDP. Population was used to account for the possibility that countries with small populations may have relatively undiversified economies and that therefore investment volatility could result from sector-specific shocks. Inflation may be important for a number of reasons, including controlling for the effects of monetary surprises and policy-coordination problems between fiscal and monetary authorities. The size of domestic credit to the private sector is a proxy for the development of financial markets. Better-developed financial markets may offer a variety of options for borrowers, thereby reducing financial fragility. Lastly, the level of investment to GDP accounts for the possibility that the magnitude of investment volatility will be larger in economies that have higher levels of investment to GDP.

The second test of the effect of governance on financial fragility is a simple difference-of-means test. This test also uses a cross-section of countries that are divided into two categories: those that experienced at least one crisis between 1984 and 2001, and those that did not. The effect of governance is tested for using a standard t-test for equality in the sample means for the governance variable of interest. If governance has a significant effect on the likelihood of a

16. The same can be said of many other countries. A simple ordinary least squares (OLS) regression using the data set described below suggests that, in the year following the beginning of a systemic banking crisis, investment to GDP falls by about 1.8 per cent. The effect is much bigger (approximately double) if additional time lags are allowed for between the crisis and its impact on investment.

banking crisis, then there should be a statistically significant difference in governance between the two groups, with the crisis countries having poorer levels of governance than the non-crisis countries.

The third set of tests exploits the time-series dimension of the data to estimate what may be termed a "business cycle model" of banking crises augmented to capture the effects of governance.[17] The model is a simple probit model of the following form (similar to that estimated by DKD 2002, amongst others):

$$Prob(Z_{it} = 1) = F(X_{1it-j}\beta) + v_{it},$$

where i denotes the country, and t the time period. In this case, Z_{it} is a binary variable that takes on a 0 when the banking system of country i is not in crisis (i.e., has a positive net-worth position) and a 1 when the country *enters* a crisis (ongoing crisis observations are dropped from the model). As before, X_{1it-j} reflects a matrix of risk factors, including macroeconomic variables lagged by j periods. Following DKD, the variables included in the analysis are per-capita GDP, per-capita GDP growth, inflation, ratio of domestic credit to GDP, credit growth, exchange rate appreciation, size of the money base relative to foreign reserve holdings, size of the current account surplus relative to GDP, and size of the government budget surplus relative to GDP. The interpretation of these variables is standard and is discussed in DKD (2002) and Santor (2003). In this test, the matrix X_{1it-j} includes a governance risk factor (such as the rule of law) lagged j periods. In this case, the change in, rather than the level of, the governance variable is used as the risk factor, for two reasons. First, many of the governance variables are highly correlated with income; using the change in the variable overcomes this collinearity problem.[18] Second, the dependent variable, Z_{it}, can also be thought of as a change variable that takes on the value of 1 when the banking system moves from a good state to a bad state. Thus, one would expect the likelihood of this change to depend on the change in the level of governance (e.g., a worsening in the level of law and order should increase the likelihood of a crisis occurring).

The starting date of a crisis is often difficult to identify (Caprio and Klingebiel 2003); to account for this fact, a lag of two years is generally used. Using a long lag avoids problems of reverse causality. For example, it may be that the government's budget deficit expands during and after a

17. The term "business cycle model" comes from Gorton (1988). He uses the term to indicate that banking crises may reflect the state of macroeconomic conditions (fundamentals), rather than sunspots.

18. The multicollinearity problem is extreme; the correlation coefficient between per-capita income and many of the governance variables is quite high (often in excess of 0.7). In preliminary analysis that included per-capita income and a governance variable in the regression, it was found that the coefficients and significance of both the per-capita income and governance variable were extremely sensitive to the measure of governance used and the sample period.

banking crisis, as the government increases spending on bailing out the banking system; using a contemporaneous measure, it may seem that this large deficit is the cause of the crisis rather than the result of one. Although the business cycle model attempts to capture some of the dynamic aspects of the data, one of its drawbacks is that it limits the analysis to using governance data where annual observations are available, thereby reducing the richness of the analysis in terms of the available sources of data.

3.2 The data set

3.2.1 Measuring financial fragility

The data on banking crises are from Caprio and Klingebiel (2003). This data set covers systemic banking crises in industrialized and developing countries from the early 1980s through 2002, though only crises from 1984 to 2001 were included in the analysis. Other data sets on banking crises have been used in the literature, but this one was preferred because it is comprehensive and the most up to date.[19] This set of crises reflects a situation in which much or all of a given country's bank capital has been exhausted. As such, it reflects a situation in which the banking system's ability to finance new or ongoing investment activities is severely curtailed. A country that has a high probability of such systemic crises is likely to be financially fragile, in the sense used in this paper.

The data on investment volatility are derived from the investment-to-GDP ratio from the Penn World Tables, version 6.1. To derive a measure of volatility, the following regression was run for each country over the period 1980–2000:

$$k_t = \beta_0 + \beta_1 tr + \beta_2 tr^2 + \beta_3 pcgdp_t + e_t,$$

where k is the investment-to-GDP variable for the country in period t, tr is a time trend, $pcgdp$ is the per-capita-to-GDP ratio, and e is an unobserved error term. Using the residuals from each country regression, the resulting root-mean-squared error (RMSE) is taken as a measure of investment volatility.

19. Previous studies, such as DKD (2002), have found their results to be robust to different data sets, including the Caprio and Klingebiel data set.

3.2.2 Institutional accounting

The governance variables come from the following sources: the International Country Risk Guide (ICRG) Political Risk Rating table; the Kaufmann, Kraay, and Zoido-Lobaton (KKZ) World Bank Governance Data set (1999); the Economic Freedom of the World (EFOW) data set (Gwartney et al. 2002); and the Polity IV Project data set (2000). The ICRG Political Risk Guide consists of 12 components, of which six (government stability, investment profile, corruption, law and order, democratic accountability, and bureaucratic quality) are used in this study as measures of various aspects of governance. Each of these six variables is an index, with higher scores representing "better" institutional outcomes. Annual observations from 1984 (when the ICRG data set begins) through 2001 were used, except in the cross-section analysis, where the simple average over the whole sample was used for each of the variables. The variables and sources are described in more detail in the data appendix.

The KKZ data set also provides data on institutional outcomes for six categories of governance. The data are derived by combining information from a variety of sources, not just one survey. As a result it is very comprehensive. Unfortunately, data are available only for the years 1997 and 2001, of which only the 1997 data are used. Although this study examines banking crises from the period 1984 to 2001, these once-off governance data are used to indicate the nature of the institutions in those countries at the time of the crisis. Implicitly, it is assumed that institutions are relatively stable over time. The variables are standardized normal, with high values corresponding to better governance.

The EFOW data are used in this study primarily to examine the role of government intervention in the economy. Observations are used from 1985 onwards, at 5-year intervals, on government ownership of banks, government transfers and subsidies, real interest rate controls, and price controls. The measures used are indexes that take values from 1 to 10, with high values corresponding to less government interference. Unfortunately, the number of countries in the EFOW data set is somewhat smaller than that of the other data sets used, and using this data set in the analysis reduces the sample size. Rather than limit the size of the data set for the whole study, results generated using this data set rely on a smaller number of observations, and the potential inconsistency with the analysis using the rest of the data set is noted.

Data on the government ownership of banks are from two sources. The first set of variables measures ownership and control of banks and was collected by La Porta, Lopez-de-Silanes, and Shleifer (2002), henceforth LLS, for their study of government-owned banks. These variables measure the share of the assets of the top 10 banks in a given country that are government-owned

(*gb_per*) or -controlled (*gc20, gc50, gc90* when the state is the largest shareholder and controls at least 20, 50, or 90 per cent of bank assets, respectively). The second measure of government ownership or control is taken from the EFOW database (Gwartney et al. 2002). This variable, *gob*, uses an index (1–10) to measure the percentage of deposits held in *privately* owned banks, where 10 corresponds to between 0 and 5 per cent and 1 corresponds to between 100 and 90 per cent. Again, the data on government-owned banks cover a subset of countries and therefore there may be a problem when comparing the analysis done with these variables with other institutional variables. This fact is noted when it occurs, and it is left to the reader to decide what weight to place on comparisons with analysis using other variables.

The last source of institutional data is the Polity IV Project data set. These variables are primarily used to examine the role of democracy and constraints on political power. Five variables from the Polity IV data set are used: indexes of democracy, autocracy, polity (a linear combination of the democracy and autocracy indexes), executive constraints, and competition in political participation. In addition, democratic accountability, from the ICRG data set, voice and accountability, from KKZ (1999), and political rights, from LLS (2002), are also used to measure the extent of democracy and constraints on political power.

To account for business cycle aspects, macroeconomic data were collected on per-capita GDP and growth, domestic credit, current account, government budget, exchange rates, and money supply. These data are available from the World Bank and the International Monetary Fund.

Together, this generates a panel of 97 countries for the period 1984 to 2001.[20] As discussed above, the data are used both in a panel and as a cross-section. Table 1 summarizes the cross-section of institutional data used in the analysis of banking crises.[21]

4. Governance and Financial Fragility: Empirical Findings

This section describes the results of each of the three aforementioned tests and discusses the effectiveness of the different types of governance mechanisms in mitigating fragility. As stated above, the first test involves a simple regression of investment volatility for each country on a set of controls and a governance measure. Tables 2a to c list the coefficient, *t*-statistic, and statistical significance associated with each variable. The second test uses the banking crises data to divide

20. Countries in transition are not included. All experienced banking crises and are fully explained by a "transition economy" dummy; they are therefore dropped from the analysis. This is not unusual in the literature (DKD 2002 also make this assumption).

21. There are some gaps in the data set, however, and some variables were not available for all countries. Thus, there may be some variation in the number of countries used in any one of the tests.

Table 1: Crisis Countries and Institutional Variables

Countries	Crisis country (1984-2000)	Political risk (1984-2000) (*polrisk*)	Bureaucratic quality (1984-2000) (*bq*)	Corruption (1984-2000) (*cor*)	Democ acc. (1984-2000) (*da*)	Law & order (1984-2000) (*laword*)	Govt. stab. (1984-2000) (*gs*)	Invest. profile (1984-2000) (*ip*)	Voice and account-ability (*va*)	Political stability (*ps*)	Govt. effective-ness (*ge*)	Regula-tory burden (*rq*)	Rule of law (*rol*)	Corruption (*gr*)
Algeria	1.00	52.81	1.63	3.31	2.75	2.31	7.94	6.06	-1.31	-2.421	-1.087	-1.173	-1.103	-0.878
Argentina	1.00	66.88	2.19	3.38	4.44	3.88	6.56	5.69	0.486	0.507	0.262	0.668	0.319	-0.275
Australia	0.00	82.06	4.00	5.00	6.00	6.00	7.75	6.56	1.626	1.184	1.459	0.962	1.596	1.601
Austria	0.00	86.00	3.88	4.81	5.38	6.00	8.38	8.31	1.446	1.377	1.219	0.901	1.812	1.457
Bahamas	0.00	70.81	3.00	1.81	4.00	4.00	6.44	7.88	1.134	0.372	0.474	0.87	0.563	0.497
Bahrain	0.00	59.56	2.69	3.31	1.63	4.63	7.19	6.44	-1.037	-0.077	0.235	0.752	0.665	-0.215
Bangladesh	1.00	44.69	0.69	1.13	3.50	1.88	4.81	4.81	-0.015	-0.398	-0.565	-0.155	-0.929	-0.289
Belgium	0.00	79.69	4.00	4.69	5.50	5.81	7.50	7.88	1.414	0.818	0.883	0.794	0.797	0.672
Bolivia	1.00	52.63	0.63	2.19	3.44	1.88	6.25	6.00	0.391	-0.143	-0.223	0.876	-0.355	-0.438
Botswana	0.00	70.25	2.50	3.63	3.88	4.75	7.81	8.06	0.779	0.743	0.221	0.572	0.502	0.535
Brazil	1.00	65.31	2.81	3.63	3.50	3.38	6.44	5.56	0.582	-0.323	-0.22	0.134	-0.222	0.058
Cameroon	1.00	51.13	2.63	2.50	2.50	2.81	7.00	5.94	-0.703	-0.724	-0.645	-0.164	-1.015	-1.105
Canada	0.00	83.44	4.00	6.00	6.00	6.00	7.75	7.63	1.389	1.027	1.717	0.869	1.549	2.055
Chile	1.00	64.19	2.25	3.25	3.63	4.38	6.88	7.06	0.617	0.451	1.166	0.898	1.086	1.029
Colombia	1.00	56.19	2.81	2.69	3.75	1.38	6.50	5.69	-0.154	-1.29	-0.057	0.29	-0.783	-0.49
Congo Dem. R.	1.00	30.97	0.75	0.25	1.31	0.94	4.06	3.56	-1.567	-2.586	-1.769	-2.34	-2.153	-1.556
Congo Rep Of	1.00	51.00	1.00	3.20	3.00	2.00	6.67	4.63	-0.773	-1.826	-0.58	-0.991	-1.435	-0.596
Costa Rica	1.00	70.25	2.00	5.00	5.00	4.00	7.13	6.56	1.345	0.908	0.554	0.927	0.553	0.577
Cote d'Ivoire	1.00	62.43	2.81	3.00	3.00	3.38	5.56	6.25	-0.569	-0.138	-0.18	0.148	-0.335	-0.079
Cyprus	0.00	65.88	3.34	3.94	4.19	3.94	7.94	8.50	1.115	0.381	1.041	0.84	0.928	1.811

(continued)

Table 1: Crisis Countries and Institutional Variables (continued)

Countries	Crisis country (1984-2000)	Political risk (1984-2000) (*polrisk*)	Bureaucratic quality (1984-2000) (*bq*)	Corruption (1984-2000) (*cor*)	Democ acc. (1984-2000) (*da*)	Law & order (1984-2000) (*laword*)	Govt. stab. (1984-2000) (*gs*)	Invest. profile (1984-2000) (*ip*)	Voice and accountability (*va*)	Political stability (*ps*)	Govt. effectiveness (*ge*)	Regulatory burden (*rq*)	Rule of law (*rol*)	Corruption (*gr*)
Denmark	0.00	86.31	4.00	6.00	6.00	6.00	7.38	7.31	1.634	1.286	1.721	1.048	1.691	2.129
Dominican Rep.	0.00	58.56	1.81	3.25	3.88	3.44	6.13	5.88	-0.078	0.121	-0.833	0.539	0.38	-0.773
Ecuador	1.00	59.63	2.00	3.06	4.00	3.88	6.75	5.06	0.268	-0.467	-0.562	0.377	-0.721	-0.819
Egypt	0.00	55.19	2.00	2.50	3.56	3.06	7.50	6.06	-0.674	-0.067	-0.138	0.118	0.128	-0.267
El Salvador	1.00	50.13	0.56	2.69	2.81	2.06	5.88	5.31	-0.1	-0.021	-0.262	1.233	-0.656	-0.354
Finland	1.00	87.81	3.97	6.00	6.00	6.00	8.69	7.88	1.632	1.514	1.635	1.14	1.736	2.085
France	0.00	79.38	3.97	4.88	5.56	5.25	7.69	7.56	1.147	0.647	1.28	0.713	1.077	1.282
Gabon	0.00	60.31	2.81	1.50	3.13	2.63	6.69	5.94	-0.314	-0.561	-1.127	0.355	-0.525	-1.015
Germany	0.00	83.88	4.00	5.13	5.44	5.63	8.06	8.06	1.462	1.317	1.409	0.889	1.483	1.62
Ghana	1.00	56.63	2.13	2.75	2.06	2.38	7.31	6.50	-0.435	-0.101	-0.287	0.278	-0.014	-0.301
Greece	0.00	68.38	2.63	4.75	4.25	4.13	6.75	5.81	1.054	0.205	0.56	0.605	0.496	0.825
Guatemala	0.00	48.94	0.56	2.50	3.06	1.75	6.06	5.50	-0.565	-0.751	-0.225	0.444	-1.106	-0.819
Guinea-Bissau	1.00	45.07	1.00	2.00	1.07	1.00	5.00	5.53	-0.454	-1.203	-0.334	-1.35	-1.615	-0.176
Guyana	0.00	54.31	1.06	1.81	3.06	2.25	5.94	5.88	1.01	-0.195	0.009	0.234	-0.14	-0.019
Haiti	0.00	36.38	0.00	1.31	1.56	1.56	3.88	2.50	-0.709	-1.709	-1.232	-1.133	-1.495	-0.535
Honduras	0.00	49.44	1.00	2.00	2.88	2.31	6.06	5.94	-0.055	-0.334	-0.409	0.081	-0.895	-0.938
Hong Kong	0.00	69.31	2.81	4.63	2.38	4.94	6.25	6.56	0.013	0.922	1.248	1.207	1.333	1.313
Iceland	0.00	85.00	4.00	6.00	6.00	6.00	8.38	6.31	1.472	1.252	1.504	0.614	1.469	1.831
India	0.00	52.94	3.00	2.81	4.06	2.94	6.38	5.94	0.364	-0.037	-0.264	-0.04	0.16	-0.306
Indonesia	1.00	51.75	1.06	1.63	2.88	2.88	7.13	6.31	-1.131	-1.289	-0.528	0.121	-0.918	-0.799
Ireland	0.00	80.75	3.78	4.50	5.69	5.00	8.19	7.69	1.526	1.426	1.361	1.157	1.395	1.567
Israel	0.00	55.56	3.47	4.63	5.19	3.69	6.56	6.31	1.06	-0.455	0.685	0.533	0.966	1.277
Italy	0.00	75.56	3.25	3.69	4.75	5.31	6.75	6.88	1.281	1.159	0.773	0.591	0.861	0.802
Jamaica	1.00	66.56	2.38	2.44	4.19	2.44	6.69	6.31	0.75	-0.344	-0.484	0.76	-0.728	-0.116
Japan	1.00	84.00	3.97	4.56	5.81	5.50	7.63	7.75	1.138	1.153	0.839	0.389	1.422	0.724

(continued)

Table 1: Crisis Countries and Institutional Variables (continued)

Countries	Crisis country (1984-2000)	Political risk (1984-2000) (*polrisk*)	Bureau-cratic quality (1984-2000) (*bq*)	Corrup-tion (1984-2000) (*cor*)	Democ acc. (1984-2000) (*da*)	Law & order (1984-2000) (*laword*)	Govt. stab. (1984-2000) (*gs*)	Invest. profile (1984-2000) (*ip*)	Voice and account-ability (*va*)	Political stability (*ps*)	Govt. effective-ness (*ge*)	Regulat-ory burden (*rq*)	Rule of law (*rol*)	Corrup-(*gr*)
Jordan	0.00	58.38	2.19	3.50	3.31	3.31	7.75	6.00	0.153	-0.057	0.63	0.417	0.708	0.139
Kenya	1.00	57.50	2.75	2.81	3.19	3.44	6.31	6.19	-0.701	-1.098	-0.899	-0.133	-1.22	-0.651
Kuwait	0.00	58.63	1.88	2.81	2.44	3.88	7.19	6.69	0	0.684	-0.063	-0.091	0.907	0.619
Luxembourg	0.00	92.13	3.97	5.81	6.00	6.00	10.50	9.31	1.489	1.398	1.674	0.947	1.621	1.671
Madagascar	1.00	57.94	1.44	4.00	3.88	3.25	6.31	5.56	0.309	-0.786	-0.295	-0.209	-0.825	-0.469
Malawi	0.00	57.56	1.19	3.44	2.31	2.75	5.50	6.38	0.062	0.039	-0.625	0.081	-0.409	-0.195
Malaysia	1.00	69.19	2.50	4.00	4.31	4.19	7.69	6.81	-0.093	0.552	0.714	0.477	0.834	0.633
Mali	1.00	48.56	0.00	1.94	2.06	2.50	5.94	5.19	0.415	-0.287	-0.052	0.29	-0.465	-0.476
Malta	0.00	72.43	2.43	3.64	4.64	4.36	8.21	7.57	1.413	1.318	0.629	0.386	0.864	0.497
Mexico	1.00	67.94	2.06	2.81	4.00	2.94	7.44	6.81	-0.107	-0.352	0.179	0.608	-0.474	-0.277
Morocco	0.00	59.00	2.19	2.81	2.25	3.88	8.50	6.31	-0.24	0.09	0.267	0.216	0.678	0.125
Namibia	0.00	72.50	2.90	4.00	4.10	5.10	8.50	7.00	0.473	0.714	0.044	0.267	0.954	0.382
Netherlands	0.00	87.81	4.00	6.00	6.00	6.00	8.44	8.00	1.638	1.479	2.03	1.141	1.584	2.026
New Zealand	0.00	85.06	4.00	5.75	5.88	6.00	7.50	7.69	1.467	1.416	1.571	1.205	1.824	2.075
Nicaragua	1.00	50.06	1.00	4.69	3.63	2.88	6.75	4.31	0.069	-0.323	-0.547	-0.103	-0.726	-0.836
Niger	1.00	49.20	1.80	2.60	3.13	2.67	5.73	4.73	-0.744	-0.763	-1.387	-0.523	-1.144	-1.567
Nigeria	1.00	48.25	1.44	1.88	2.25	2.13	6.63	5.63	-1.234	-1.054	-1.321	-0.352	-1.097	-0.954
Norway	1.00	85.00	3.72	5.75	6.00	6.00	7.69	7.06	1.674	1.414	1.666	0.932	1.833	1.687
Oman	0.00	65.19	2.38	3.00	2.25	4.13	7.94	7.06	-0.57	0.912	0.9	0.305	1.077	0.484
Panama	1.00	54.06	0.75	2.00	3.06	2.44	5.56	5.50	0.665	0.149	-0.277	1.002	-0.392	-0.458
Pap. New Guinea	0.00	60.56	2.81	3.13	4.81	3.38	6.25	5.44	0.121	-0.398	-0.694	-0.129	-0.307	-0.854
Paraguay	1.00	60.19	0.88	1.38	2.38	3.06	6.38	7.13	-0.419	-0.571	-1.1	0.37	-0.695	-0.958
Peru	1.00	48.50	1.19	3.00	2.50	1.94	6.00	5.63	-0.687	-0.529	0.173	0.669	-0.522	-0.2
Philippines	1.00	52.88	1.13	2.38	4.31	2.44	5.88	5.25	0.632	0.273	0.126	0.565	-0.078	-0.228
Portugal	0.00	76.63	2.56	4.75	5.06	5.19	7.88	6.88	1.483	1.385	1.151	0.889	1.083	1.218

(continued)

Table 1: Crisis Countries and Institutional Variables (continued)

Countries	Crisis country (1984-2000)	Political risk (1984-2000) (*polrisk*)	Bureaucratic quality (1984-2000) (*bq*)	Corruption (1984-2000) (*cor*)	Democ acc. (1984-2000) (*da*)	Law & order (1984-2000) (*laword*)	Govt. stab. (1984-2000) (*gs*)	Invest. profile (1984-2000) (*ip*)	Voice and accountability (*va*)	Political stability (*ps*)	Govt. effectiveness (*ge*)	Regulatory burden (*rq*)	Rule of law (*rol*)	Corruption (*gr*)
Senegal	1.00	56.75	1.81	3.00	3.56	2.31	7.38	6.56	-0.292	-0.871	0.047	-0.338	-0.097	-0.235
Sierra Leone	1.00	39.50	1.00	1.94	1.81	2.69	4.88	3.06	-1.623	-1.519	0.009	-1.501	-0.906	-0.019
Singapore	0.00	80.88	3.59	4.50	2.88	5.38	8.75	7.63	0.126	1.386	2.082	1.245	1.939	1.948
South Africa	0.00	63.94	3.56	4.94	4.63	2.50	7.31	6.81	0.992	-0.527	-0.01	0.244	-0.351	0.299
South Korea	1.00	70.60	3.19	3.38	3.69	3.50	7.81	7.19	0.909	0.164	0.409	0.219	0.943	0.159
Spain	1.00	72.81	3.06	4.25	5.31	4.75	7.81	8.19	1.356	0.58	1.603	0.864	1.032	1.214
Sri Lanka	1.00	45.75	2.00	3.25	4.31	1.75	5.50	6.06	-0.157	-1.628	-0.612	0.616	-0.361	-0.124
Sweden	1.00	85.25	4.00	6.00	6.00	6.00	8.06	7.13	1.601	1.411	1.573	0.853	1.623	2.085
Switzerland	0.00	89.56	4.00	5.75	6.00	6.00	9.56	8.19	1.68	1.69	1.986	0.878	1.996	2.072
Tanzania	1.00	59.63	0.56	3.19	2.94	4.06	6.94	5.81	-0.283	0.565	-0.485	0.183	0.161	-0.924
Thailand	1.00	62.63	3.06	2.88	3.19	4.25	6.88	6.31	0.222	0.246	0.01	0.192	0.413	-0.165
Togo	1.00	47.31	0.81	2.00	1.63	2.38	6.00	5.88	-1.051	-0.906	-0.374	-0.853	-0.799	-0.242
Trinidad & Tob	0.00	62.69	2.19	2.81	3.00	4.00	6.88	6.56	0.953	0.315	0.521	0.718	0.514	0.511
Tunisia	0.00	61.88	2.00	3.00	2.69	3.44	7.69	6.50	-0.589	0.661	0.633	0.429	0.648	0.02
Uganda	1.00	44.88	0.75	2.44	1.81	2.38	6.75	5.81	-0.517	-0.98	-0.251	0.184	-0.013	-0.466
United Kingdom	0.00	81.81	4.00	5.19	5.69	5.31	7.50	7.94	1.506	0.92	1.966	1.206	1.689	1.707
United States	0.00	83.38	4.00	4.75	6.00	6.00	8.25	8.31	1.523	1.096	1.366	1.135	1.254	1.407
Uruguay	1.00	64.81	1.31	3.00	4.19	3.00	6.75	7.06	0.77	0.348	0.618	0.949	0.27	0.43
Venezuela	1.00	65.75	1.81	3.00	4.94	4.00	7.13	5.38	0.153	-0.25	-0.849	0.09	-0.662	-0.725
Zambia	1.00	56.69	1.00	2.75	3.19	2.81	5.44	6.06	-0.046	-0.002	-0.399	0.252	-0.402	-0.614
Zimbabwe	1.00	56.31	2.63	3.13	2.81	3.00	6.44	5.06	-0.666	-0.542	-1.129	-0.341	-0.146	-0.319

Note: See Data Appendix for sources and descriptions.

(continued)

Table 1: Crisis Countries and Institutional Variables (continued)

Countries	*pright*	*comlawa*	*gb_per*	*gc20*	*gc50*	*gc90*	Govt. subsidies and transfers (*transubs*)	Real interest controls	Price controls	Deposits with govt. banks (*gob*)
Algeria	2	0	1.00	1.00	1.00	1.00	7.74	0.00	2.18	0.00
Argentina	6	0	0.61	0.61	0.61	0.61	7.47	3.75	8.00	5.00
Australia	7	1	0.12	0.21	0.21	0.04	6.81	10.00	6.55	9.38
Austria	7	0	0.50	0.70	0.70	0.00	3.71	9.38	6.64	5.19
Bahamas	7	1	.	.	.	.	9.73	10.00	4.00	10.00
Bahrain	2	1	0.07	0.03	0.03	0.03	9.63	9.09	4.00	8.00
Bangladesh	5	1	0.95	1.00	1.00	0.90	.	8.13	0.00	0.13
Belgium	7	0	0.28	0.22	0.22	0.17	2.99	10.00	3.73	10.00
Bolivia	6	0	0.18	0.18	0.18	0.18	9.45	5.50	7.18	9.09
Botswana	6	1	.	.	.	.	8.21	6.25	6.00	5.00
Brazil	6	0	0.32	0.57	0.23	0.14	6.98	0.50	3.36	5.00
Cameroon	1	0	.	.	.	.	9.69	6.00	0.00	0.75
Canada	7	1	0.00	0.00	0.00	0.00	5.74	10.00	8.09	10.00
Chile	6	0	0.20	0.20	0.20	0.20	6.86	8.75	9.83	8.00
Colombia	4	0	0.54	0.52	0.52	0.52	9.01	8.00	5.17	8.00
Congo Dem. R.	1	0	.	.	.	.	9.74	0.00	2.00	0.00
Congo Rep. Of	4	.	.	.	.	.	9.34	6.63	0.00	0.00
Costa Rica	7	0	0.91	0.91	0.91	0.91	8.39	7.38	6.18	10.00
Cote d'Ivoire	2	0	0.21	0.20	0.16	0.14	9.46	7.25	1.09	4.25
Cyprus	7	1	0.00	0.00	0.00	0.00	7.66	9.38	1.09	8.00
Denmark	7	0	0.09	0.11	0.09	0.09	3.85	10.00	7.91	10.00
Dominican Rep.	4	0	0.39	0.39	0.39	0.39	9.60	4.36	5.09	9.38
Ecuador	6	0	0.41	0.41	0.41	0.41	9.46	2.25	2.18	6.69
Egypt	2	0	0.89	0.96	0.86	0.81	7.39	7.50	2.18	5.00
El Salvador	5	0	0.26	0.39	0.39	0.14	9.56	8.75	5.27	.

(continued)

Table 1: Crisis Countries and Institutional Variables (continued)

Countries	*pright*	*comlawa*	*gb_per*	*gc20*	*gc50*	*gc90*	Govt. subsidies and transfers (*transubs*)	Real interest controls	Price controls	Deposits with govt. banks (*gob*)
Finland	7	0	0.31	0.31	0.31	0.31	5.18	10.00	7.64	8.00
France	7	0	0.17	0.26	0.22	0.05	2.84	8.75	7.09	10.00
Gabon	3	0	.	.	.	.	9.67	6.63	1.09	2.50
Germany	7	0	0.36	0.37	0.37	0.30	4.80	10.00	8.91	5.00
Ghana	4	1	.	.	.	.	9.48	2.38	2.36	3.13
Greece	7	0	0.78	0.85	0.84	0.69	5.19	7.50	3.18	4.06
Guatemala	4	0	0.22	0.22	0.22	0.22	9.80	7.88	6.18	8.00
Guinea-Bissau	5	0	.	.	.	.	.	0.18	3.27	.
Guyana	6	1	.	.	.	.	.	4.67	.	.
Haiti	3	0	.	.	.	.	8.15	0.55	1.09	.
Honduras	5	0	0.30	0.30	0.30	0.30	9.37	6.75	4.00	.
Hong Kong	4	1	0.00	0.00	0.00	0.00	9.87	10.00	9.45	10.00
Iceland	7	0	0.71	0.71	0.71	0.71	7.35	7.38	6.33	2.19
India	4	1	0.85	1.00	0.95	0.60	8.50	8.00	3.55	0.75
Indonesia	1	0	0.43	0.43	0.43	0.43	9.56	8.00	4.73	3.13
Ireland	7	1	0.04	0.04	0.04	0.04	5.08	9.88	8.09	8.00
Israel	7	1	0.65	0.80	0.82	0.00	5.10	5.00	5.00	0.00
Italy	7	0	0.36	0.28	0.28	0.17	2.72	8.75	5.55	5.00
Jamaica	6	1	.	.	.	.	9.58	6.00	4.00	8.44
Japan	7	0	0.00	0.00	0.00	0.00	6.99	9.88	5.55	5.00
Jordan	4	0	0.26	0.29	0.29	0.22	9.12	5.45	2.00	5.00
Kenya	1	1	0.30	0.49	0.22	0.09	9.15	8.00	3.27	4.06
Kuwait	3	0	0.33	0.46	0.32	0.18	7.44	10.00	6.00	5.00
Luxembourg	7	0	.	.	.	.	3.11	10.00	3.82	10.00
Madagascar	6	0	.	.	.	.	9.80	0.73	0.00	0.75

(continued)

Table 1: Crisis Countries and Institutional Variables (continued)

Countries	*pright*	*comlawa*	*gb_per*	*gc20*	*gc50*	*gc90*	Govt. subsidies and transfers (*transubs*)	Real interest controls	Price controls	Deposits with govt. banks (*gob*)
Malawi	6	1	.	.	.	.	9.50	5.88	2.18	2.00
Malaysia	4	1	0.10	0.10	0.10	0.10	9.22	10.00	4.36	5.00
Mali	6	0	.	.	.	.	9.74	6.63	2.18	2.00
Malta	7	0	.	.	.	.	6.05	7.50	1.09	0.00
Mexico	4	0	0.36	0.36	0.36	0.36	8.61	6.50	2.91	3.00
Morocco	3	0	0.38	0.51	0.42	0.24	9.12	7.38	2.18	5.00
Namibia	6	1	.	.	.	.	9.18	7.27	3.09	.
Netherlands	7	0	0.09	0.10	0.10	0.07	2.02	10.00	7.09	9.38
New Zealand	7	1	0.00	0.00	0.00	0.00	4.75	9.38	9.55	8.44
Nicaragua	4	0	0.63	0.63	0.63	0.63	8.42	2.38	2.18	.
Niger	5	0	.	.	.	.	.	6.73	2.18	3.13
Nigeria	1	1	0.10	0.13	0.08	0.08	9.78	1.50	0.36	3.13
Norway	7	0	0.44	0.87	0.62	0.08	3.78	10.00	6.64	8.63
Oman	2	0	0.26	0.27	0.27	0.24	9.48	10.00	4.00	8.00
Panama	6	0	0.17	0.17	0.17	0.17	8.41	10.00	3.09	8.00
Pap New Guinea	6	1	.	.	.	.	9.34	8.33	.	5.00
Paraguay	4	0	0.48	0.48	0.48	0.48	9.51	5.27	5.09	.
Peru	3	0	0.26	0.24	0.24	0.24	9.33	2.38	4.36	8.00
Philippines	6	0	0.27	0.34	0.34	0.18	9.95	7.50	4.00	7.06
Portugal	7	0	0.26	0.24	0.24	0.24	5.76	9.38	5.55	1.56
Senegal	4	0	0.28	0.37	0.22	0.20	9.77	6.00	1.27	2.00
Sierra Leone	1	1	.	.	.	.	9.56	0.75	4.18	2.00
Singapore	3	1	0.14	0.34	0.05	0.00	9.56	10.00	8.55	10.00
South Africa	7	1	0.00	0.00	0.00	0.00	8.77	8.75	6.17	10.00
South Korea	6	0	0.25	0.42	0.22	0.13	9.40	10.00	0.09	5.00

(continued)

Table 1: Crisis Countries and Institutional Variables (concluded)

Countries	*pright*	*comlawa*	*gb_per*	*gc20*	*gc50*	*gc90*	Govt. subsidies and transfers (*transubs*)	Real interest controls	Price controls	Deposits with govt. banks (*gob*)
Spain	7	0	0.02	0.07	0.00	0.00	5.46	10.00	6.45	8.00
Sri Lanka	4	1	0.71	0.76	0.69	0.69	8.62	8.50	4.00	5.00
Sweden	7	0	0.23	0.30	0.30	0.12	2.05	10.00	7.18	8.00
Switzerland	7	0	0.13	0.15	0.15	0.10	5.77	10.00	6.55	5.00
Tanzania	3	1	0.95	0.95	0.95	0.94	8.72	2.75	2.18	0.00
Thailand	5	1	0.17	0.22	0.22	0.00	9.82	9.38	4.36	7.81
Togo	2	0	.	.	.	.	9.48	7.88	1.09	2.00
Trinidad & Tobago	7	1	0.02	0.02	0.02	0.02	7.28	6.88	5.09	8.00
Tunisia	2	0	0.37	0.82	0.37	0.03	8.04	7.38	5.09	4.06
Uganda	3	1	.	.	.	.	.	1.75	2.36	2.00
United Kingdom	7	1	0.00	0.00	0.00	0.00	5.56	10.00	8.91	10.00
United States	7	1	0.00	0.00	0.00	0.00	6.58	10.00	8.91	10.00
Uruguay	6	0	0.69	0.69	0.69	0.69	6.48	7.25	5.09	5.00
Venezuela	5	0	0.58	0.63	0.53	0.53	8.72	1.38	0.83	8.00
Zambia	5	1	.	.	.	.	9.17	0.50	1.09	3.13
Zimbabwe	3	1	0.30	0.50	0.30	0.07	8.16	7.88	3.09	3.13

Note: See Data Appendix for sources and descriptions.

Table 2a: Investment Volatility and Law and Order

Dependent Variable: Investment Volatility					
	Law and order (ICRG)	Rule of law (KKZ)	Property rights and judicial system (EFOW)	Investor protetction (ICRG)	Common law dummy (LLS)
Constant	2.11*** (6.22)	0.62* (1.80)	2.62*** (6.43)	2.77*** (3.56)	1.20*** (4.60)
Population	-2.22e^{-06}* (-1.94)	-210e^{-06}* (-1.81)	-1.94e^{-06}* (-1.72)	-2.00e^{-06}* (-1.65)	-2.06e^{-06}* (-1.81)
Investment to GDP	0.09*** (4.19)	0.086*** (3.76)	0.09*** (4.05)	0.06*** (2.83)	0.05*** (2.71)
Inflation	-0.0003 (-0.78)	-0.0004 (-0.90)	-0.0004 (-1.04)	-0.0003 (-0.66)	8.39e^{-05} (0.20)
Domestic credit to GDP	-0.007 (-1.50)	-0.004 (-0.85)	-0.005 (-1.21)	-0.008 (-1.51)	-0.010** (-2.39)
Governance variable	-0.438*** (-3.88)	-0.636*** (-3.48)	-0.386*** (-4.14)	-0.277** (-1.97)	0.188 (0.85)
n	88	85	85	85	96
Adj R-sq	0.21	0.17	0.22	0.09	0.06
R-sq	0.25	0.22	0.26	0.14	0.11

Note: ***, **, * denote significance at 1 per cent level, 5 per cent level, and 10 per cent level, respectively.

Table 2b: Investment Volatility and Government Involvement in the Economy (Government Control of Banking System)

Dependent Variable: Investment Volatility					
	Government ownership	Government control (20%)	Government control (50%)	Government control (90%)	Deposits with government owned banks (EFOW)
Constant	1.19*** (3.23)	1.16*** (3.23)	1.18*** (3.28)	1.25*** (3.46)	1.35*** (5.50)
Population	$-1.36e^{-06}$ (-1.40)	$-1.39e^{-06}$ (-1.42)	$-1.38e^{-06}$ (-1.41)	$-1.34e^{-06}$ (-1.39)	$-1.83e^{-06}$* (-1.79)
Investment to GDP	0.03* (1.73)	0.03* (1.70)	0.03* (1.72)	0.03* (1.76)	0.04** (2.25)
Inflation	0.0003 (0.59)	0.0003 (0.059)	0.0003 (0.59)	0.0003 (0.61)	$1.78e^{-05}$ (0.04)
Domestic credit to GDP	-0.005 (-1.11)	-0.005 (-1.05)	-0.005 (-1.09)	-0.006 (-1.27)	-0.007* (-1.81)
Governance variable	-0.043 (-0.10)	0.020 (0.05)	-0.009 (-0.02)	-0.16 (-0.38)	-0.014 (-0.44)
n	66	66	66	66	89
Adj R-sq	0.01	0.01	0.01	0.01	0.04
R-sq	0.09	0.09	0.09	0.09	0.09

Note: ***, **, * denote significance at 1 per cent level, 5 per cent level, and 10 per cent level, respectively.

(continued)

Table 2b: Investment Volatility and Government Involvement in the Economy (continued)

Dependent Variable: Investment Volatility					
	Bureaucratic quality (ICRG)	Bureaucratic quality (KKZ)	Corruption (ICRG)	Corruption (KKZ)	Regulatory burden
Constant	1.59*** (5.10)	0.80*** (2.50)	1.94*** (5.30)	0.89*** (2.77)	1.17*** (4.40)
Population	$-1.65e^{-06}$ (-1.35)	$-2.30e^{-06}$** (-1.96)	$-2.32e^{-06}$* (-1.93)	$-2.34e^{-06}$** (-1.96)	$-2.27e^{-06}$** (-1.97)
Investment to GDP	0.07*** (2.95)	0.08*** (3.65)	0.07*** (3.11)	0.08*** (3.43)	0.07*** (3.31)
Inflation	-0.0002 (-0.38)	-0.0002 (-0.50)	-0.0001 (-0.27)	-0.0002 (-0.49)	-0.0003 (-0.75)
Domestic credit to GDP	-0.008 (-1.57)	-0.007 (-1.35)	0.007 (-1.47)	-0.007 (-1.47)	-0.008* (-1.80)
Governance variable	-0.292** (-2.02)	-0.500*** (-2.67)	-0.306*** (-2.57)	-0.420** (-2.43)	-0.55*** (-2.87)
n	85	92	85	91	96
Adj R-sq	0.09	0.13	0.12	0.12	0.14
R-sq	0.15	.18	0.17	0.17	0.18

Note: ***, **, * denote significance at 1 per cent level, 5 per cent level, and 10 per cent level, respectively.

(continued)

Table 2b: Investment Volatility and Government Involvement in the Economy (concluded)

Dependent Variable: Investment Volatility						
	Transfers and subsidies (EFOW)	Freedom to exchange with foreigners (EFOW)	Real interest rate controls (EFOW)	Price controls (EFOW)	Government stability (ICRG)	Political stability (KKZ)
Constant	-0.64 (-1.16)	1.70*** (2.85)	1.90*** (5.69)	1.43*** (5.23)	2.55*** (2.98)	0.88*** (2.63)
Population	$-1.82e^{-06}$* (-1.94)	$-2.22e^{-06}$* (-1.72)	$-1.94e^{-06}$* (-1.68)	$-1.96e^{-06}$* (-1.67)	$-2.08e^{-06}$* (-1.69)	$-2.16e^{-06}$* (-1.84)
Investment to GDP	0.06*** (3.35)	0.06* (2.40)	0.06*** (2.98)	0.06*** (3.04)	0.06*** (2.67)	0.08*** (3.55)
Inflation	$-3.39e^{-05}$ (-0.10)	$-1.99e^{-05}$ (-0.04)	-0.0005 (-1.03)	$2.47e^{-05}$ (0.06)	-0.0002 (-0.37)	-0.0003 (-0.65)
Domestic credit to GDP	-0.006 (-1.61)	-0.010* (-1.91)	-0.007 (-1.42)	-0.009** (-2.01)	-0.009* (-1.78)	-0.008* (-1.68)
Governance variable	0.202*** (3.98)	-0.079 (-0.68)	-0.121*** (-2.60)	-0.084* (-1.65)	-0.209 (-1.50)	-0.455*** (-2.78)
n	90	85	97	95	85	91
Adj R-sq	0.18	0.05	0.12	0.09	0.07	0.14
R-sq	0.23	0.11	0.17	0.14	0.13	0.19

Note: ***, **, * denote significance at 1 per cent level, 5 per cent level, and 10 per cent level, respectively.

Table 2c: Investment Volatility and Democracy and Accountability

Dependent Variable: Investment Volatility								
	Democracy (Polity IV)	Autocracy (Polity IV)	Polity (Polity IV)	Competitive participation (Polity IV)	Executive constraints (Polity IV)	Democratic accountability (ICRG)	Voice and accountability (KKZ)	Political rights
Constant	1.56*** (5.06)	0.77** (2.31)	1.23*** (4.09)	1.97*** (5.83)	1.93*** (6.10)	2.33*** (6.23)	1.10*** (4.02)	1.63*** (4.80)
Population	$-1.67e^{-06}$ (-1.37)	$-1.68e^{-06}$ (-1.44)	$-1.65e^{-06}$ (-1.35)	$-1.97e^{-06}$* (-1.72)	$-1.52e^{-06}$ (-1.33)	$-1.67e^{-06}$ (-1.46)	$-2.13e^{-06}$* (-1.82)	$-2.20e^{-06}$* (-1.84)
Investment to GDP	0.07*** (3.08)	0.07*** (3.48)	0.07*** (3.05)	0.07*** (3.55)	0.08*** (3.66)	0.07*** (3.50)	0.07*** (3.25)	0.06*** (2.89)
Inflation	0.0002 (0.26)	$-8.42e^{-05}$ (-0.20)	0.0002 (0.37)	$-9.06e^{-05}$ (-0.22)	$-6.83e^{-05}$ (-0.16)	-0.0002 (-0.54)	-0.0001 (-0.34)	$-9.46e^{-05}$ (-0.22)
Domestic credit to GDP	-0.011** (-2.04)	-0.01** (-2.49)	-0.011** (-2.12)	-0.009* (-1.94)	-0.010** (-2.18)	-0.007 (-1.53)	-0.009* (-1.86)	-0.010** (-2.20)
Governance variable	-0.100*** (-2.57)	0.132** (2.55)	-0.059** (-2.46)	-0.302*** (-2.84)	-0.203*** (-3.08)	-0.397*** (-3.82)	-0.346** (-2.25)	-0.088 (-1.36)
n	80	94	80	94	94	85	97	97
Adj R-sq	0.14	0.14	0.13	0.15	0.16	0.19	0.11	0.08
R-sq	0.19	0.18	0.19	0.20	0.21	0.24	0.15	0.12

Note: ***, **, * denote significance at 1 per cent level, 5 per cent level, and 10 per cent level, respectively.

the countries into two groups—those that experienced a crisis during the period 1984–2001 and those that did not—and performs a simple *t*-test to determine the difference in the mean value of each institutional treatment variable. The results are given in the second column of Table 3. The results from the third set of tests, which exploit the time dimension of the panel and account for business cycle effects, are provided in the third column of Table 3. Table 4 provides benchmark results for the business cycle model without the governance variable. This benchmark equation has also been estimated by other authors (DKD 2002 and Santor 2003). The results presented in this equation are quite consistent with the findings of the other authors.[22]

To aid in the presentation of the results, the governance mechanisms are classified into three broad categories: law and order, government regulation and control, and democracy and constraints on executive power. The first category reflects mechanisms that permit the functioning of an "arms-length system" by enforcing property rights and increasing the ability of agents to rely on contracts. The second category reflects the mechanisms that involve a more interventionist approach by government. The third reflects the view that governments play an important role in the operation and functioning of the financial system, and that constraints on their power can influence the outcome in financial markets.

4.1 Law and order

It is widely assumed that a society can reduce agency problems and improve contractability by providing a clearly identifiable, mutually acknowledged higher authority that recognizes and enforces property rights. The first category of variables examines this aspect of governance using the ICRG law, order and investment profile variables, and KKZ rule-of-law variable. Tables 2 and 3 reveal that institutions that promote the rule of law seem to have a statistically significant effect on financial fragility. In the case of investment volatility, the ICRG law and order and investor protection, the KKZ rule of law, and the EFOW property rights and judicial system variables all have the expected sign and are statistically and quantitatively significant. For example, Argentina's investment volatility score is 0.967 and its ICRG law and order score is 3.9. If it had invested in governance institutions that promoted the rule of law, to raise its law and order score to match that of Spain (4.6), the empirical results suggest that Argentina would have reduced its investment volatility by 0.30 points (-0.44 x 0.7), or by about 30 per cent!

22. The coefficient on the budget surplus variable has the opposite sign of that found by Santor (2003). There are a number of possible reasons for this difference; for example, Santor's findings may reflect reverse causality (large deficits are associated with crises as governments are forced to bail out the banking system). There may be other reasons; in private correspondence, Santor suggests that other possibilities may include some sort of multicollinearity problem with the current account surplus, owing to the twin-deficits phenomena. Alternatively, this result may simply be data-set specific.

Table 3: Banking Crises and Governance

Explanatory variable	Difference in means (crisis countries against non-crisis countries)			Probit results for institutional change (lagged first difference)
Law and order	Crisis country mean	Non-crisis country mean	*t*-statistic, *p*-value	dF/dx, *p*-value, n obs.
Common law dummy (0,1)	0.28	0.47	1.8, 0.08	n/a
Law and order index, 1984-2000, (0,6)	3.1	4.4	4.7 0.00	-0.120, 0.060 n=848
Rule of law, 1997, (std normal)	-0.25	0.76	5.5, 0.00	n/a
Investment profile (0,12)	6.0	6.9	3.9, 0.00	-0.066, 0.018, n=848
Government				
Govt. ownership and control of banks				
gb_per (percentage)	0.40	0.26	-2.1, 0.04	n/a
gc20	0.45	0.31	-1.96, 0.05	n/a
gc50	0.40	0.28	-1.8, 0.07	n/a
gc90	0.34	0.17	-2.6, 0.01	n/a
gob, index (0,10) (0 =100% govt. ownership, 10=0%)	4.6	6.6	2.9, 0.01	n/a

(continued)

Table 3: Banking Crises and Governance (continued)

	Difference in means (crisis countries against non-crisis countries)			Probit results for institutional change (lagged first difference)
Bureaucratic quality	Crisis country mean	Non-crisis country mean	*t*-statistic, *p*-value	dF/dx, *p*-value, n obs.
bq index (0,4)	1.85	2.9	4.6, 0.00	0.026, 0.784, n=848
ge (std normal)	-0.13	0.66	4.4, 0.00	n/a
Corruption				
cor (0,6)	3.0	3.9	3.46, 0.00	-0.009 0.696 n=848
gr (std normal)	-0.18	0.71	4.8, 0.00	n/a
Other				
transsubs (0,10)	8.4	7.0	-3.23, 0.00	n/a
freedom to exchange with foreigners (0,10),	5.7	6.6	3.23, 0.00	n/a
real interest rate controls (0,10)	5.8	8.2	4.00, 0.00	n/a
price controls (0,10)	3.5	5.2	3.22, 0.00	n/a
regulatory burden, 1997, (std normal)	0.1	0.6	3.3, 0.00	n/a

(continued)

Table 3: Banking Crises and Governance (concluded)

	Difference in means (crisis countries against non-crisis countries)			Probit results for institutional change (lagged first difference)
Political stability	Crisis country mean	Non-crisis country mean	*t*-statistic, *p*-value	dF/dx, *p*-value, n obs.
gs (0,12)	6.6	7.4	3.7, 0.00	-0.040, 0.076, n=848
ps (std normal)	-0.3	0.5	4.8, 0.00	n/a
Democracy and accountability				
democ index (0,10)	5.0	6.7	2.1, 0.04	-0.018, 0.398, n=802
autoc index (0,10)	2.3	1.8	-0.8, 0.4	0.057, 0.121, n=802
polity index (-10,10)	2.7	4.9	1.6, 0.12	-0.019, 0.144, n=802
parcomp index (1,5)	3.2	3.84	2.4, 0.02	-0.277, 0.05 n=803
exconst index (1,7)	4.6	5.4	1.8, 0.07	-0.012, 0.718, n=803
pright	4.4	5.6	2.8, 0.01	n/a
da index (0,6)	3.5	4.2	2.7, 0.01	-0.122, 0.091, n=848
va, 1997, (std normal)	0.0	0.7	3.9, 0.00	n/a

Table 4: DKD Business Cycle Model Probit Regression Results (robust estimation)

	Probit results benchmark macro model. N=848 Pseudo rsq= 0.1371
	dF/dx. (*p*-value).
Risk factor	
per-capita GDP	-0.062 (0.059)
per-capita GDP growth	-0.006 (0.453)
inflation	-0.0004 (0.623)
ratio of money to foreign reserves	0.005 (0.075)
domestic credit (% of GDP)	0.002 (0.269)
credit growth	0.386 (0.007)
current acc. surplus (% of GDP)	-0.008 (0.075)
budget surplus (% of GDP)	0.02 (0.003)
exchange rate (% appreciation)	-0.184 (0.059)

Similar results hold for banking crises. The simple *t*-tests reveal that all the law and order measures have the predicted sign and that they are all statistically significant at the 1 per cent level. This supports the view that institutions that establish and enforce property rights play an important part in mitigating crises. These findings are also consistent with the findings of previous researchers (DKD 1998; Santor 2003).

Legal origin may also play an important role (LLSV 1998). Contracts are often difficult to write because not every contingency can be covered. In this sense, Rajan and Zingales (1998) argue that the law can offer a "helping hand." They argue that, in countries that have a common-law system, the courts are more likely to honour "the spirit rather than the letter of the contract," thus enabling the contracts to offer more investor protection. If so, common-law systems are more likely to reduce agency problems. On the other hand, the flexibility of the system may provide "wiggle room" for a cunning entrepreneur—especially if the judicial system is easily corruptible.

The results on legal origin are mixed. In the investment-volatility regression, the common-law dummy suggests that non-common-law countries experience less investment volatility, but the variable is not statistically significant. The cross-section banking crisis results, however, tend to favour the former view. Approximately 28 per cent of the crisis countries were common-law countries, compared with about half of the non-crisis countries. This difference is statistically significant, but only at the 10 per cent level.

4.2 Government regulation and control

4.2.1 Government ownership of banks

There are a variety of reasons why government regulation and control of the financial sector may eliminate financial fragility. For example, in the model developed in the previous section, the government may have a role to play in eliminating multiple equilibria and thereby ensuring one aspect of stability. Recall that, when there are multiple equilibria, the model behaves much like the game of assurance. In this case, the government could solve the commitment problem by committing itself to funding a minimum level of investment. Via its influence over government-owned or -controlled banks, a government could eliminate the low-investment, low-credit equilibrium and hence eliminate a source of instability. Moreover, it is possible that the government may be better inclined than private banks to solve some agency problems. According to this view, government ownership and control should reduce the propensity for financial crisis.

On the other hand, government ownership and control of banks may exacerbate the agency problem,[23] for a number of reasons. First, government-owned banks may be corrupted from their benevolent activities by self-interested government officials and the interests of borrowers.[24] Second, the propensity of government-owned banks to fund investment projects on the basis of political motives, rather than purely economic ones, is another important factor that may increase the cost to borrowers of securing a return on their deposits.

To test these hypotheses, variables measuring the government ownership of banks are included in the analysis. Because the data are difficult to collect, the sample of countries is smaller than for other institutional variables. The results from the investment-volatility equations are not supportive of the view that government ownership of banks has any effect on fragility. The variables from LLS (2002) on the government ownership of banks suggest that more government ownership is correlated with less volatility, whereas the EFOW deposits with government-owned banks (*gob*) (measured as 1 minus the share of deposits at private banks) suggest the opposite. None of the variables is statistically significant. On the other hand, countries that had banking crises were more likely to have greater government ownership of banks, or a greater share of deposits at government-owned banks. The *t*-statistics are all statistically significant. These results are not supportive of the view that government-owned and -controlled banks are able to reduce agency costs and eliminate fragility. Rather, they suggest the opposite, at least with respect to banking crises. Unfortunately, there are no annual data on government ownership of banks to use in estimating the business cycle model.

4.2.2 Other government regulations and control

Other forms of government regulation and control may also be important for reducing agency costs. For example, governments may be able to ensure that borrowers commit themselves to repaying through direct controls and regulations in the economy. By limiting competition, these controls can potentially create substantial rents for firms favoured by the government. The threat of losing these rents can influence firm behaviour. Lam (2002), for example, argues that such economic and political suasion was important in preventing Hong Kong from experiencing a speculative attack on its currency during the Asian crisis. These regulations and controls may also be important in ensuring that firms and governments are able to maintain strong relationships. To

23. LLS (2002) summarize the arguments for and against government ownership of banks.
24. So, too, may the owners and managers of private banks, but they may be more disciplined by profit motives and the influence of shareholders. Senior government officials may also see themselves as "above the law" if they have influence in the workings of the judicial system. The disciplining influence of democracy is considered in section 4.2.3.

the extent that governments use these sources of economic power to mitigate agency problems, variables capturing these effects should be negatively correlated with the likelihood of a crisis. On the other hand, as discussed earlier, governments may easily abuse their power or be corrupted by the interests of private firms. Backman (2001) provides a detailed account of the extent of government connections to the finance arms of a number of Asian conglomerates. His analysis suggests that cronyism is rife among some governments in East Asia, with government connections playing an important role in the operation of business and the diversion of depositor funds. Furthermore, regulations and controls can distort economic decisions. In either case, increased incidence of government control and regulation would increase the likelihood of a crisis.[25]

For investment volatility, the results suggest that transfers and subsidies smooth investment, which is statistically significant (a higher value of the transfers and subsidies variable corresponds to a lower ratio of government transfers and subsidies to GDP). Regulatory measures, though, indicate the opposite result. The signs on the variables measuring controls on foreign transactions, interest rate controls, price controls, and general regulatory burden (again, higher values correspond to less government involvement) all suggest that greater interference in the economy adds to investment volatility; with the effects of real interest rate controls and the KKZ regulatory burden, the measures are statistically significant. In the case of banking crises, the results show a consistent pattern: greater interference in the economy via transfers and subsidies, international controls, interest rate controls, price controls, and just general regulatory burden. All increase the likelihood of a crisis and all are statistically significant. This suggests that government interference is more likely to exacerbate agency problems than to solve them, although the use of transfers and subsidies may be able to smooth investment. Annual observations of direct government intervention were not available and so there are no results from the business cycle model.

It is reasonable to assume that a good bureaucracy is capable of providing quality services, supervision, and regulation. As such, higher levels of bureaucratic quality are likely to be associated with less investment volatility and reduced likelihood of a banking crisis. The quality of the bureaucracy is measured by two variables: the ICRG bureaucratic quality variable (*bq*), and the KKZ government effectiveness variable (*ge*). According to the results shown Table 2c, both suggest that better bureaucracies are consistent with less investment volatility, with both having

25. Rajan and Zingales (1998) suggest that such controls that encourage relationships are fine in economies, as long as there are plenty of high-return investment opportunities, but problematic when there is poor institutional infrastructure (law and order/investor protection) and limited opportunities for investment.

the expected sign and both being statistically significant. The same is true for the cross-section of banking crises. The results from the business cycle model, however, suggest the opposite, though the variable is not statistically significant.

Consistent with the view that cronyism worsens agency problems and increases the likelihood of fragility is the finding that corruption is, on average, worse in crisis countries (as measured by the ICRG *cor* variable and the KKZ *gr* variable). This finding is statistically significant in both the cross-section banking crisis data and investment volatility data. The sign on the ICRG corruption variable in the business cycle model is consistent with the story, but not statistically significant. Overall, then, corruption does not seem to facilitate business and smooth out agency problems.

4.2.3 Democracy and constraints on the use of power

Because governments are more likely to be motivated to serve the interests of the public if they are accountable, one would expect that democracy would play an important role in ensuring that governments serve the interests of the population. If industry is concentrated in the hands of a few, and deposits are widely held, then governments in democracies may be more inclined to serve the interests of the lenders rather than borrowers. Democracy is a disciplining device that ensures that governments undertake better governance measures. On the other hand, democracy can itself be a source of fragility, for two reasons. First, when the population has a substantial amount of savings deposited in banks, democratic governments will keep the financial system operating, but if the size of deposits is small, then the pressure on governments to develop and maintain good governance measures is also small. Second, governments can use their coercive power not only to help enforce property rights, but to erode them. Democracy puts the government at the disposal of competing interests, and to win and maintain power governments may be tempted to redistribute income and wealth, thus eroding property rights and potentially contributing to the agency problems faced by society.

The data set contains a number of variables on democracy. The Polity IV Project data set contains four relevant variables: *Democ*, *Autoc*, *Polity*, and *Parcomp*. *Democ* is an index from 0 to 10 that measures the extent to which the country is a democracy. *Autoc* is an index from 0 to 10 that measures the extent to which the country is an autocracy; it is not simply a reflection of the democracy score. The absence of any form of strong government may lead to low scores on both counts. *Polity* is calculated as the difference between *Democ* and *Autoc*. *Parcomp* measures, on a scale from 1 to 5, the extent to which participation in the political process is competitive, with higher values representing greater competition. Other data sets also contain data on the accountability of the government to the public. The ICRG data set contains the variable *da*

(democratic accountability). This variable measures how responsive the government is to its people. The KKZ data set has *va* (voice and accountability). It measures (from various sources) different aspects of the political process, civil liberties, and political rights. The *pright* variable is a measure of political rights taken from LLS (2002).

Another method of preventing government officials from aiding in the diversion of funds from lenders to borrowers is to put constraints on executive power. The Polity IV Project data set contains a variable that measures this aspect of executive power directly: *Exconst*, an index from 1 to 7 that measures the extent of institutionalized constraints on the decision-making powers of chief executives. Higher values represent tighter constraints on executive power. In western democracies, these constraints are often imposed by legislatures; they could also be imposed by independent judiciaries. A finding that this variable is significant in limiting banking crises suggests that, left to their own devices, the most senior of government officials are likely to be tempted away from mitigating agency costs and may even contribute to them by assisting borrowers to avoid repayment.

The results on democracy and constraints on political power are perhaps the most striking results in this study. For each type of test, regardless of the variable or the source, the statistics reveal that countries with unaccountable and unconstrained governments and officials are more likely to experience a financial crisis. Only the political rights (*pright*) variable is not statistically significant in the investment volatility regression, whereas only the autocracy and polity measures are not statistically significant in the banking crisis cross-section. In the business cycle model, both ICRG democratic accountability and the *Exconst* variables are statistically significant. This supports the view that, left to their own devices, government officials tend to behave in ways that aggravate agency problems rather than alleviate them and, as a result, financial fragility is worse in such countries.

4.2.4 Other variables (political and government stability)

There are a variety of political/government stability and agency problems. According to ICRG, government stability refers to the ability of the government's declared programs and its ability to stay in office. When government stability is high, there is certainty, which brings with it a dimension of security over property rights (whether legally enforced or implicitly enforced through reputation or other mechanisms). When government stability is low, the probability of a change in government is raised; security over property is reduced and there is an increase in the likelihood of a policy that could redistribute income and wealth. Thus, one plausible argument is that political stability reinforces the existing set of property rights, whereas instability erodes

them. According to this view, government stability alleviates agency problems and reduces the likelihood of fragility in the financial system. The data support this view. Both the government/ political stability variables are statistically significant and suggest that stability is important for ensuring a sound banking sector in the cross-section analysis, and the ICRG *gs* variable has the expected sign and is significant in the business cycle model. Both have the expected sign in the investment volatility equation, with the KKZ variable being statistically significant.

5. Conclusion

Good governance plays a significant role in determining the extent to which a country is likely to have a crisis. If one is prepared to go a step further and attempt to evaluate which institutions are good and which are bad, then, on the basis of this study's results, one would argue that institutions that encourage a well-functioning market by recognizing and enforcing property rights, making elected officials more accountable, limiting the ability of government to directly interfere and control the actions of firms, and reducing corruption and the abuse of public office are worth pursuing. Institutions that attempt to solve agency problems by having an unchecked government become involved in the relationship between borrower and lender are likely to be associated with increased financial fragility, which suggests that such arrangements tend to leave governments and officials exposed to the temptations of office that may exacerbate agency problems rather than mitigate them.

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Data Appendix

Variable	Description
Macro Data	
Crisis	0,1 variable that takes on a value of 1 if a crisis is reported (ongoing crises deleted from data set). Source: Caprio and Klingebiel (2003).
lpc_gdp	Log of per-capita GDP. Source: World Bank Economic Indicators.
pcgr	Per-capita GDP growth. Source: World Bank Economic Indicators.
dcps	Domestic credit to the private sector. Source: World Bank Economic Indicators.
m2res	Money supply to foreign reserves. Source: IMF International Financial Statistics.
budgdp	Size of the government budget surplus to GDP. Source: IMF International Financial Statistics and World Bank (2003).
cagdp	Current account surplus to GDP. Source: IMF International Financial Statistics and World Bank (2003).
Exchange rate	The appreciation of the exchange rate in terms of the U.S. dollar. Source: IMF International Financial Statistics.
Institutional Data	
laword	Law and order: a six-point index measuring (i) the strength and impartiality of the legal system, and (ii) the observance of the law. Source: The International Country Risk Guide (ICRG) political risk rating table.
rule of law	Composite measuring the rule of law in a given counrty during 1997. Source: Kaufmann et al. (1999).
da	Democratic accountability: a six-point index measuring the responsiveness of a government to its people. Source: The ICRG political risk rating table.
va	Voice and accountability: a composite measuring the extent to which citizens are able to participate in the selection of governments during 1997. Source: Kaufmann et al. (1999).
gv	Government stability: a 12-point index assessing both the ability of the government to carry out its declared programs and its ability to stay in office. Source: The ICRG political risk rating table.
ps	Political instability and violence: a normalized composite measuring the likelihood that the government will be destabilized or overthrown by possibly violent or unconstitutional means during 1997. Source: Kaufmann et al. (1999).
bq	Bureaucratic quality: a four-point index that measures the strength and expertise of bureaucracies to govern without drastic changes in policy or interruptions in services during periods of political transition. Source: The ICRG political risk rating table.
ge	Government effectiveness: a normalized composite measuring the ability of the government to implement and produce policies during 1997. Source: Kaufmann et al. (1999).
ip	Investment profile: a 12-point index assessing the risk to investment. It is based on an assessment of payments delays, profits repatriation, and contract viability/expropriation. Source: The ICRG political risk rating table.
cor	Corruption: a six-point index measuring corruption within the political system. This measure primarily assesses excessive patronage, nepotism, and cronyism. Source: The ICRG political risk rating table.
gr	Graft: the exercise of public power for private gain during 1997. Source: Kaufmann et al. (1999).
polrisk	Political risk: a 100-point index made up of a number of indicators (including the above) to measure the political stability of a country. Source: The ICRG political risk rating table.
democ	Democracy: an index from 0 to 10 measuring the extent to which the country is a democracy. Source: Polity IV Project.
autoc	Autocracy: an index from 0 to 10 measuring the extent to which the country is an autocracy. Source: Polity IV Project.
polity	Democracy-autocracy.

(continued)

Variable	Description
parcomp	Competitive participation in the political process. Source: Polity IV Project.
exconst	Constraints on executive power. Source: Polity IV Project.
Regtrans	Change in the nature of the political regime defined by a three-point or greater movement in the polity variable. Source: Polity IV Project.
pright	Political rights: a measure of political rights taken from LLS (2002).
Government Ownership of Banks	
gb_per	Measure the share of the assets of the top 10 banks in a given country that are directly or indirectly government-owned. Source: LLS (2002).
gc20, gc50, gc90	Measure the share of the assets of the top 10 banks in a given country that are government-owned (*gb_per*) or -controlled (*gc20, gc50, gc 90* when the state is the largest shareholder and controls at least 20, 50, or 90 per cent of bank assets, respectively. Source: LLS (2002).
gob	An index (1-10) to measure the percentage of deposits held in government-owned banks, where 10 corresponds to between 0 and 10 per cent and 1 corresponds to between 0 and 5 per cent. Source: Economic Freedom of the World (Gwartney et al. 2002).
Government Regulation and Control	
transsubs	Government transfers and subsidies. Ten-point index measuring the extent of transfers and subsidies as a percentage of GDP. Source: Economic Freedom of the World (Gwartney et al. 2002).
real interest rate controls	Index measuring the extent of controls leading to negative real interest rates. Source: Economic Freedom of the World (Gwartney et al. 2002).
price controls	Index measuring the extent of price controls. Source: Economic Freedom of the World (Gwartney et al. 2002).
freedom to exchange with foreigners	Index measuring the extent of international trade and capital controls. Source: Economic Freedom of the World (Gwartney et al. 2002).
regulatory burden	Normalized composite measuring the extent of excessive regulations and controls in 1997. Source: Kaufmann et al. (1999).

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